PHD

An Investigation of Derivative Financial Instrument Usage by the UK's Largest Non-financial Firms

Anjana Gayan Kurukulasuriya, Kurukulasuriya Marakkalage

Award date:
2019

Awarding institution:
University of Bath

An Investigation of Derivative Financial Instrument Usage by the UK's Largest Non-financial Firms

Kurukulasuriya Marakkalage Anjana Gayan Kurukulasuriya

A thesis submitted for the degree of Doctor of Philosophy

University of Bath

School of Management

First submitted: January 2018

Re-submitted after *viva voce* examination and corrections: November 2018

Declaration of any previous submission of the work

The material presented here for examination for the award of a higher degree by research has not been incorporated into a submission for another degree.

Candidate's signature: *Anjana Kurukulasuriya* (Signed electronically)

Declaration of authorship

I am the author of this thesis, and the work described therein was carried out by myself personally.

Candidate's signature: *Anjana Kurukulasuriya* (Signed electronically)

Table of Contents

List of Tables

List of figures

List of figures

Thanks/acknowledgements

First and foremost, I would like to thank my supervisors, Professor Richard Jackson, Dr Matt Bamber and Dr David Bence for their time, dedication, advice and encouragement and continuous support. Their profound knowledge and extensive research experiences inspired me all along during my doctoral study, and their kind support helped me through the tough times. This thesis would not have been completed without their invaluable guidance.

I am very grateful to my examiners, Professor Kevin McMeeking and Dr Richard Fairchild, for the time and care which they have taken, and the expertise they have brought to bear, in review of the thesis, holding the viva voce examination, and providing me with a number of comments which have helped me to improve my work; and for the encouragement they have given me.

I would also like to thank the University of Bath and the academic as well as administrative staff for their contribution towards this study.

There have been many others who have offered help and guidance. My gratitude to all the participants at the following annual conferences, presentations and seminars for their comments and suggestions throughout the last few years during my PhD studies: British Accounting & Finance Association (BAFA); BAFA South West Area Group (SWAG); Accounting and Finance Colloquium, Gregynog; doctoral conferences at the University of Bath.

Last, but certainly not least, my warmest thanks to my parents, sisters, brother-in-law, my wife and my son for all their love and motivation during this process. Finally, I would like to dedicate this thesis to my parents. Also to my son, Sithija Kurukulasuriya; hopefully he will be inspired and encouraged by this.

Abstract

The subject of derivatives use and their accounting is one of the most controversial and complex topics in accounting. In recent times, there have been too many scandals involving the use, abuse and misuse of derivatives. This has highlighted the importance of disclosing these instruments in financial statements rather than holding them off-balance sheet.

The purpose of this study is to examine the extent and nature of derivatives usage amongst UK non-financial firms. The sample covers the pre- and post-financial crisis years where the study finds significant variance in the level of usage but not significant variance in the determinants of usage.

Following this, the study provides details regarding the determinants and value relevance of derivatives use; it exploits the data to perform analysis across hedging instruments and types. Finally, employing a unique identification process, the study investigates whether financial analysts understand and use financial accounting information about derivatives.

The importance of this study is twofold. Firstly, the economic significance of derivatives and secondly, the theoretical importance of derivatives. To date, the IFRS derivatives fair value regime has remained largely untouched by empirical researchers. This study fills this vacuum, covering a financial meltdown and a recovery period. This would have direct benefits to UK financial markets in terms of providing much needed research into this area. Further, the methodologies used and the results of this study can be of particular importance to researchers and practitioners alike.

List of abbreviations

BVA	Book value
CF	Cash flow
FE	Fixed effects
FV	Fair value
FVTPL	Fair value through profit and loss
IFRS	International Financial Reporting Standards
MVE	Market value
NI	Net investment
NOL	Net operating losses
NPV	Net present value
OCI	Other comprehensive income
RE	Random effects

Chapter 1: Introduction

1.1 Introduction

Derivative financial instruments are significant to the global economy (Bamber and McMeeking, 2016). Although derivatives enable firms to manage risks in the presence of uncertainty, these instruments are well-known for their overall complexity (Chang, Donohoe and Sougiannis, 2016). Further, there has been a significant increase in the complexity of accounting for financial instruments (Gebhardt, 2012), especially with fair value measurements (Glover, Taylor and Wu. 2016). Gebhardt, (2012) highlighted the poor current state of knowledge on use of financial instruments in non-financial firms outside the US and Canada, and the importance of rich and current data, especially from IFRS financial reporting. One of the main objectives of this thesis is to enhance current knowledge on derivatives use in the UK non-financial firms using accounting information mandated by IFRS'.

This chapter provides an overview of the framework and the background of the thesis. It begins with the importance of the study and states the research objectives and contributions of the study. It also details the data and definitions used in the study. In order for readers to understand the thesis, the later part of this thesis (appendix 1) will cover a number of more generic topics related to derivatives and finally it will describe the basic principles underpinning the measurement and reporting of derivatives under the IFRS accounting regime.

The remainder of this thesis is set out as follows. Chapter 2 includes the literature review; Chapter 3 describes the research methodologies and data sources; Chapters 4, 5, 6 and 7 focus on achieving the research objectives. The final chapter will conclude the thesis with the main findings and possible recommendations for future research, as there are many important research questions remaining in this field of study.

1.2 Importance of the study

The importance of this study can be found in two key areas. Firstly, the economic significance of derivatives; secondly the theoretical importance.

Over the years, with the development of financial markets, derivative financial instruments have become more standardised and increasing tradable. Even though estimating the overall size of the derivative markets is difficult, mainly because OTC markets are decentralised and the parties are not required to report their transactions, the following statistics show the enormity of the outstanding derivative financial instruments around the world.

A typical OTC derivative trade engages a financial intermediary such as a broker or a bank. Hence it is possible to determine the size of the OTC derivatives market by analysing the financial firms' data. A survey by the Bank for International Settlements (BIS) on OTC and exchange traded derivatives volumes and positions shows that by the end of 2017 the total notional amounts of the outstanding OTC derivatives positions were $542,435 billion[1], a 577% increase compared to $94 trillion in June 2000.

Further, the survey shows that, based on derivatives traded on organized exchanges across the world, the value of notional outstanding futures contracts at the end of September 2017 was $33.6 trillion. These exchange traded futures contracts brought in an astonishing daily turnover of $6.5 trillion, during the September 2017. The International Swap and Derivatives Association (ISDA) provides the notional values of several swap products. Their data show that the total notional outstanding value of combined derivatives amounted to $590.8 trillion at December, 2012; that consisted of $489.7 trillion of interest rate swaps, $67.3 trillion of forex swaps, $25 trillion of credit default swaps, $6.2 trillion of equity derivatives and £2.6 trillion of commodity derivatives.

[1] This figure symbolizes a substitute for the value of the total underlying value against which claims are traded. For example, this consists of interest rate swap contracts worth $415 trillion. However gross market value of these contracts was $8.5 trillion.

The above figures indicate that the outstanding notional values of derivatives positions are massive. However, these numbers should be treated with care; because of the way they managed. As an example, assume that Tesco Plc intends to close one of its swap contracts with Barclays Bank Plc where Tesco makes fixed rate payments and receives floating rate payments. One of the ways for Tesco to carry out this transaction is to contact several other banks, and find the most beneficial swap contract with same conditions where it receives a fixed rate and pays a floating rate payment. Once the second swap contract is finalised, the fixed payment Tesco receives will match the fixed payment it should make, cancelling out the final effect of the swap with the Barclays. Even though the above transaction settled out the original swap, the overall effect on Tesco is that it has inflated the outstanding OTC notional figure. Conversely, if neither party involved in the derivative contract is taking part in the BIS survey, those notional values are missed out from the survey results presented above. In order to improve the transparency of derivatives contracts, in September 2009 G20 leaders agreed to several commitments regarding the operation of OTC derivatives markets, including that all OTC derivatives positions should be reported to trade repositories (BIS Settlements report, Jan 2012). This would help to minimise the under-estimation of derivatives values in the BIS data.

Previous research on derivatives has studied from different angles. Changes in accounting rules for derivatives has enhanced the transparency of derivatives reporting, increasing the information available about derivatives in financial statements (see chapter 2). Additionally, in order to minimise losses from derivatives speculation, standard setters demanded detailed disclosure with additional information. Nevertheless, most previous studies focused mainly on derivatives headline data; few studies have emphasised the limitations of this approach, calling for exploring beyond the broad numbers for overall derivatives use (Nguyen, Mensah and Fan, 2007; Gebhardt, 2012). Faulkender (2005) underlined the importance of understanding the impact of hedging with derivatives and how firms respond to macroeconomic shocks and spill overs. Prior empirical studies have relied heavily on data from the US, the world’s largest economy. However, results from US derivatives use should not unthinkingly be generalised to other developed and developing economies.

Nguyen *et al*., (2007); Gebhardt (2012); Faulkender (2005) have raised several crucial points, firstly, how firms handle the financial risks and manage the underlying causes. Secondly the availability of risk management tools and how they are being used in practice. Finally, how firms disclose the outcomes of these transactions and if the reported figures are understood and being used by investors. This study acknowledges the significance of examining the derivatives literature not only from an academic perspective, but also with an economic perspective and will address the following key research question - "Unravelling derivatives reporting: what do the accounting numbers tell us?"

1.3 Research Objectives and the contribution of the thesis

1.3.1 Overall research objectives

The use of financial derivative instruments has grown over the years to meet the needs of businesses in their risk management activities. Similarly, over the years, a number of accounting standards relates to reporting of financial instruments have been published, revised and re-published. Using the IFRS fair value accounting regime, this research investigated several issues that have remained largely untouched by previous empirical researchers, especially during a financial meltdown and a recovery period.

The main research objectives of the study are

(1) to investigate the extent and nature of derivatives usage in UK non-financial firms.
(2) to investigate the determinants of propensity to use derivatives in UK non-financial firms
(3) to investigate the value relevance of derivative usage in non-financial firms
(4) to investigate the extent of use of financial accounting information upon derivatives

1.3.2 Contribution of the thesis

The literature review demonstrates the lack of empirical literature on corporate use of derivatives in the UK context. The majority of previous studies have focused on the USA, hence the focal contribution of this study is that it uses detailed information on corporate risk management practices using derivatives amongst UK non-financial firms. This study also contributes to the literature by covering a much larger and broader period of eight years from 2005 to 2012; it therefore covers post-IFRS implementation as well as the pre- and post- financial crisis periods.

The study of the extent of derivatives use helps fill the empirical research gap in the existing literature by providing a comprehensive assessment of accounting information about derivatives use in FTSE 350 firms. It reveals that under the IFRS accounting regime the amount of derivative use disclosures provided by FTSE 350 listed firms is generally high and, with some effort, gathering reconcilable data about different derivative instruments and their hedging categories is possible. Further, it shows that this process can even be extended to industry level.

One of the major contributions of examining the determinants of derivatives use is that it examines the impact of fair values of derivatives on the hedging decisions of UK non-financial firms in an economic slowdown and the subsequent recovery period. This study, using the largest non-financial firms in the UK, initially analyses the determinants of corporate derivatives use and examine the theoretical arguments that firms use derivatives to reduce their expected costs of financial distress, for tax benefits, to tackle underinvestment costs, to reduce cash flow volatility, to gain the advantage of economies of scale and enhance their firm values.

In doing so, this study contributes to the existing knowledge in two ways. Firstly, it provides empirical evidence on factors that encourage firms to use derivatives and compares the findings against literature to see whether the results are consistent with existing theories. Secondly, the extent to which these instruments are used. Findings support the theoretical argument that firms use derivatives to reduce their expected costs of financial distress.

As hedging has a cost, comparing the materiality of hedging benefits with the potentially negative contribution of unhedged exposure is challenging. The difficulties associated with derivatives hedging, coupled with the breadth and complexity of prudent accounting for derivatives, pose a great challenge in evaluating the performance of a derivative hedge on financial statements. The study's findings on the value relevance of derivatives suggest that, despite the current complex accounting treatments for derivatives and that not all hedging transactions are identified or disclosed properly in the financial statements, evaluating hedging activities and measuring their effectiveness on financial statements is possible; hence the study contributes to changing the perception of derivatives and their related accounting treatments.

Moreover, this study specifically contributes to the very limited body of literature on financial analysts' understanding of derivatives accounting-related information (Ramnath, Rock and Shane, 2008; Beyer, Cohen, Lys and Walther, 2010; Chang *et al*., 2016) by providing evidence to show that, notwithstanding their financial expertise, analysts rarely mentioned or predicted outcomes of derivatives activities and their implications for financial statements. This study, amongst the first studies of its kind to highlight the low level of analysts' understanding of derivative-related disclosures in the UK, therefore provides valuable insight into the importance of enhancing their knowledge of financial instrument reporting and disclosure. In addition, this study also makes a methodological contribution by applying a sequential research design, which includes an exploratory qualitative approach, followed by quantitative analysis, which was used to obtain the relationship between hedge accounting and analysts' understanding of these standards. This thesis, therefore, makes an important contribution to understanding a significant, but understudied research area relevant to the UK.

The results of this study are useful to practitioners and academics alike. The research findings will be useful to derivative users and investors as knowledge of derivative use is currently very limited. Additionally, it could assist corporate governance bodies, regulators, creditors, financial statement users and shareholders to value firms more accurately and see how well managers manage the risks associated with day-to-day business operations. Finally, as this is the only study with comprehensive post-IFRS derivatives data, it provides guidance for future researches by identifying the current knowledge gaps.

1.4 Key data of the study

As the research focused on derivative usage in UK non-financial firms, financial firms are excluded from the study. Since larger firms are expected to use derivatives more than smaller firms (Smith and Stulz, 1985, Sinkey and Carter, 2001), FTSE 350 non-financial firms have been selected as the main sample. This is the combination of the FTSE 100 and FTSE 250 Index firms, which have the largest market capitalisation on the London Stock Exchange. Firms in the Banks, Equity Investment Instruments, General Financial, Life and Insurance sectors were excluded from the sample. This gave a total of 232 firms representing almost every major sector on the London Stock Exchange. Firms were grouped together by industry for the sector analysis.

Derivatives data were extracted from the annual financial reports from 2005 to 2012. Independent variables were downloaded from Datastream. To my knowledge, this is the largest and most comprehensive study carried out to date involving IFRS FTSE 350 non-financial fair value derivatives data. By using publicly available data such as annual reports as the data sources and by selecting all FTSE 350 non-financial firms as the sample, this study reduced the small sample bias, a limitation in previous studies.

1.5 Summary

This Chapter introduced the research topic and the importance of this study. Further it presented the motivation and the objectives followed by the research questions and the data that it used to assess the research questions. Thereafter, based on the findings, the contribution of the study was highlighted.

Chapter 2: Literature review

2.1 Introduction

The subject of derivative use and its accounting implications is a research topic of interest to many academics. The studies (Seow and Tam, 2002; Zhang, 2009) focus on accounting for derivatives examine the reporting and disclosure of derivatives and their implications for users, managers and policy makers. The studies looking at the usefulness of the compulsory accounting and reporting practices for derivatives examined the quality of derivative disclosures in order to explain the association between derivative-related disclosures and market responses (Schrand, 1997; Ameer, 2009; Perignon and Smith, 2010). Market-oriented derivatives research is mainly concerned with the characteristics of derivatives users and their usefulness (Berkman and Bradbury, 1996; Štulec, Baković and Dužević, 2013; Sang, Abu and Osman, 2013). Evidence suggests that hedging forms a significant part of non-financial firms' financing policy (Bodnar, Hayt, Marston and Smithson,1995; Bodnar, Hayt and Marston, 1998; Judge, 2006).

This chapter reviews the theoretical and empirical research surrounding derivatives use. It begins with the accounting and disclosure of derivatives as financial instruments (section 2.2); then reviews the literature on derivatives use in non-financial firms around the world (section 2.3); uses for derivatives (section 2.4); and I finally point to the research objectives of this paper (section 2.10).

2.2 Accounting for derivatives

> *"Accounting for financial instruments is one of the most controversial standard setting issues. Attempts by standard setters to expand the scope of fair value measurement provoked fierce opposition from preparers, in particular from the financial industry but also, albeit less frequently and less scathingly, from non-financial firms. Academic research could help to bring the discussion onto a more objective level. Most of the existing research focuses on the financial industry and uses US disclosure data from the 1990s. More recent papers use recognition and measurement data from IFRS financial statements, again primarily from the financial industry"* (Gebhardt, 2012: p.267).

> *"Accounting is sometimes seen as a veil-as a mere detail of measurement-leaving the economic fundamentals unaffected. The validity of such a view would be overwhelming in the context of completely frictionless competitive markets"* (Plantin, Sapra and Shin, 2008: p.435-436).

However, in the real world, as a result of imperfections there is room to debate financial accounting treatment for financial instruments; especially with regards to their recognition, measurement and re-measurement, presentation and disclosure. As explained in Chapter 1, changes in accounting for derivatives over the past few decades have increased the volume of available information about derivatives use to users of firms' financial statement. Currently, as a result of harmonisation in the area of financial reporting regulations, the International Financial Reporting Standards (IFRS) Foundation is responsible for establishing accounting standards throughout the international reporting community. Even with these developments, there are still many unresolved issues such as accounting for derivative financial instruments. These issues have attracted academic research interest. Furthermore, well known corporate failures and the 2007 financial crisis raised important questions with regards to the role of the current financial instruments reporting rules and whether they allow investors to make accurate decisions about firms' risk exposure from their derivative transactions (Barth and Landsman, 2010). The first part of the literature review examines previous studies that attempted to fill the gaps in financial instruments reporting and disclosure literature.

2.2.1 Background of derivatives reporting literature

Since the early 1970s financial instruments reporting and disclosure has undergone various changes. Existing research (Barth, 1994; Nelson, 1996; Walton 2004; Acharya and Richardson, 2009) into financial reporting changes mainly identified two important milestones in derivatives disclosure and reporting: namely the historical cost measure approach and the fair value measure approach. Prior to the existence of the fair value accounting approach, historical cost convention dominated financial reporting. Therefore, literature examined the usefulness of these accounting changes (e.g. Barth, Beaver and Landsman, 2001); especially with regards to derivatives (Barth, 1994; Nelson, 1996; Skinner, 1996; Wang, Alam and Makar, 2005; Ahmed, Kilic and Lobo, 2011). Meanwhile some studies attempted to identify the determinants of derivatives-related disclosures (e.g. Aggarwal and Simkins, 2004); and some examined the impact of accounting standards on recognition and measurement of derivatives (Chalmers and Godfrey, 2004).

Changes in reporting rules increased available information about the content of derivatives; hence the ability to develop new theories (Smith and Stulz, 1985). These subsequent accounting changes enhanced the reporting of off-balance sheet transactions, which could have a material impact on a firm (Akhigbe, Martin and Newman, 2008). Further, these amendments to accounting requirements are still an on-going process. Hence, over the last few decades, derivatives reporting has remained an area where constant changes can be seen regularly.

2.2.2 Need for disclosure

Prior to investigating derivatives disclosure it’s vital to identify the definition of disclosure. However, after carrying out an extensive literature review, Bamber (2011: p.215) concluded that “literature lacks a definition of disclosure”. Hence, this section will examine disclosure in a broader sense. Currently, financial instruments disclosure-related literature has developed into a distinct branch of research and covers various areas of accounting and finance as well as many other areas. Verrecchia (2001) classifies the accounting literature on disclosure into three broad categories; namely association-based disclosure, discretionary-based disclosure and efficiency-based disclosure. Association-based disclosure studies attempt to identify the effects of disclosure on market participants at the time of a disclosure event (e.g. Lintner, 1969; Karpoff, 1987). Discretionary-based disclosure seeks to answer why managers will choose to disclose or withhold information relevant to firm value in spite of knowing that outsiders interpret withheld information rationally (e.g. Verrecchia, 1983; Jovanovic, 1982). Efficiency-based disclosure refers to the disclosure arrangements that are preferred unconditionally (e.g. Hakansson, Kunkel and Ohlson, 1982).

By reviewing the empirical disclosure literature, Healy and Palepu (2001) summarised the theoretical background to the demand for disclosure under four different categories. Firstly, disclosure reduces information asymmetry and agency problems; secondly the role played by auditors and information intermediaries; thirdly the element affecting management decisions on financial reporting and disclosures; and finally the economic consequences of disclosures.

Amongst studies addressed the issues of economic significance arising from financial reporting and disclosure; Leuz and Wysocki (2008) identified liquidity and low cost of capital as a direct capital market outcome of firms' disclosure. Beyer *et al*. (2010) investigated the role of accounting-related disclosure; especially with regards to firm valuation. Furthermore, Verrecchia (2001) supported Leuz and Wysocki's (2008) liquidity argument, saying that the corporate disclosure can mitigate any adverse selection issues; hence disclosure could increase market liquidity. In addition to Leuz and Wysocki (2008), other studies have confirmed the direct and indirect relationship between disclosure and the cost of capital (Merton, 1987; Barry and Brown, 1985; Shleifer and Wolfenzon, 2002; Lambert, Leuz and Verrecchia, 2007). Young & Guenther (2003) reported that firms in those countries with highly regulated regimes are mainly focused on the disclosure of market and credit risk arising from the use of financial instruments. Additionally, they noted that only a very limited number of studies have addressed the much broader corporate risk disclosure. This study extends Leuz and Wysocki's (2008) and Beyer *et al*.'s (2010) work by investigating in more detail the risk reporting requirements captured in IFRS 7.

Currently there are a number of studies available that investigated the purpose of annual reports and firm level disclosure (Gray, Meek and Roberts, 1995; Botosan and Plumlee, 2002). "Analysing derivative financial instrument disclosure by firms in an environment that is unregulated but subject to increased scrutiny provides insight into the necessity of mandating disclosure." (Chalmers and Godfrey, 2004: p.120). Beretta and Bozzolan (2004) highlighted that with this firm level disclosure investors are in a better position to recognise the risks a manager takes to create firm value; therefore, they can deal effectively with the management of their own investment portfolios. By investigating disclosures between 1992 and 1996 in an Australian context, they identified that managers' reputation and the institutional pressure on them to respond to demands for information increased the disclosure. Therefore, a theoretical argument could be made (e.g. Hirshleifer and Teoh, 2003; Chamley, 2004) that the gap between voluntary and mandatory disclosure is reducing when a firm makes a voluntary disclosure to follow best practice irrespective of the mandatory accounting requirements.

The importance of disclosure on financial derivatives increased with well-publicised corporate failures. The next section will therefore examine several historical incidents where the misuse of derivatives contributed to huge corporate losses.

2.2.3 Scandals and misuse of derivatives

Two noticeable examples from the early 1990s are Allied Lyons's $250 million loss on the writing and selling of currency options and Showa Shell Sekiyu's $1.58 billion loss on foreign exchange forwards (Grant and Marshall, 1997). Further, by the end of 1993, due to oil derivatives activity, MG Refining & Marketing, a U.S subsidiary of the German Metallgesellschaft AG, reported $1.3 billion losses in its financial statements (Culp, Miller and Neves, 1998).

Even though there had been a widespread discussion of the reasons behind these derivatives losses in 1994 and 1995, several financial and non-financial firms reported losses due to derivatives transactions. In April 1994 Gibson Greetings, a US manufacturer of seasonal cards, wrapping paper, and related stationery products, announced losses totalling $19.7 million on interest rate swaps (Overdahl and Schachter, 1995) while in the same month Kashima Oil reported losses of $1.5 billion on currency options. Further, an American multinational consumer goods giant Procter & Gamble reported that it had lost $157 million before tax as a result of swap transactions. Again, in December of that year Orange County in California became the largest municipality in U.S. history to declare bankruptcy due to losses caused by transactions related to derivatives (Halstead, Hegde and Klein, 2004).

On February 1995, Barings PLC, one of the oldest and most renowned merchant banks in the UK had to declare bankruptcy following failed rescue efforts from Bank of England (Drummond, 2002). Careful examination of all these incidents shows that derivatives instruments alone were not solely responsible for these failures. Absence of external accountability and reporting transparency, coupled with failure of the senior management to monitor the trading activities, equally contributed to these losses (Overdahl and Schachter, 1995; Hogan, 1997; Dunne and Helliar, 2002).

One of the notable alleged corporate misuse of derivatives is the Enron scandal. Partnoy (2003) argued that the collapse of Enron was not down to fraud related to Special Purpose Entities, but largely due to derivatives; more specifically, Enron's derivatives transactions other than those involving the Special Purpose Entities. However, Gwilliam and Jackson (2008) found that trading in derivatives was just one reason for the collapse of Enron. They argued that “disclosures might have alerted financial statement users to the extent to which mark to market accounting was being employed”; however “it would not have been possible for them to determine the extent to which overall reported profitability relied upon the use of mark to market accounting nor the significant degree of subjectivity involved in many of the valuations employed”.

2.2.4 Historical cost measure approach

Bleck and Liu (2007) analysed the economic consequences of the historic cost accounting approach and described the reporting of derivatives under the historical cost regime as equivalent to granting managers a favourable call option on a firm's assets. They argued that the historical cost approach allowed managers to report gains when asset values appreciated while allowing them to conceal losses when asset values decreased as the managers had the option to report these assets under acquired historical cost. Further, this enabled managers to engage in risky projects which could leave the firm open to unanticipated vulnerabilities. Additionally, they added that the historical cost approach transferred asset price volatility across over time while overall increasing the volatility; hence leading to asset price crashes. Therefore, the importance of reforming the historical cost accounting treatment for financial instruments was echoed by various parties. As an alternative measurement to historical cost accounting, fair value was proposed by the FASB and the IASB, the main global standard setters, in their accounting standards. Further, the move from historical cost accounting to fair value accounting demonstrates an increasingly economics-based approach to accounting measurement (Hitz, 2007; Laux and Leuz, 2010)

2.2.5. Fair value accounting

One of the major controversial subjects with regards to derivatives and other financial instruments is fair value measurement (Walton 2004). Under fair value reporting firms are required to measure and report their assets and liabilities on an on-going basis. In addition to that, firms have to report unrealised losses if the fair value of a liability increases or the fair value of an asset decreases, resulting a reduction in comprehensive income or firms' equity. Although the concept of fair value has played a role in US GAAP for many years, accounting standards that require fair value accounting have surged in numbers and significance over the last decade (Acharya and Richardson, 2009). Barth (2006) emphasised the importance of fair values by stating that the fair value measures are capable of meeting most of the qualitative characteristics of useful financial statement information.

Most of the early studies that examined fair value accounting have explored whether share prices reflected the previously disclosed unrealised securities gains and losses. For instance, Barth (1994) and Petroni and Wahlen (1995) found that gains and losses from financial instruments that were more likely to be traded in active markets were reflected in the share prices while Barth, Landsman, and Wahlen (1995) examined whether the volatility of the gains and losses was integrated in the share prices. Beatty, Chamberlain and Magliolo (1996) analysed security returns of insurance companies and bank holding companies during the period surrounding the adoption of SFAS 115 and concluded that banks' share prices were adversely affected by fair value accounting while there was no compelling evidence for insurance firms.

As with any other accounting methodology, the literature gives various pros and cons in fair value accounting. Benston (2008) examined fair value accounting under SFAS 157 and found several important shortcomings. The first argument they came up with was that, since the fair values are not restricted to actual market prices, it could be costly for a manager to determine. Secondly, fair values other than level 1 could be readily manipulated by opportunistic and overoptimistic managers and difficult for auditors to verify. One of the major arguments against the fair value rules was the complexity and the fear of increased earnings volatility and balance sheet volatility (Lins, Servaes and Tamayo, 2011), especially when markets become illiquid and market prices are volatile (Chen, Tan, Wang, 2013). With regards to derivatives, Melumad, Weyns and Ziv (1999) argued that the recognition of derivatives using fair value makes derivatives use more transparent, resulting prudent risk management. However, Plantin *et al*. (2008) came with a theoretical argument that more transparency can change firms hedging practices decisions. Furthermore, some studies accessed the information and decision usefulness of fair value accounting (Hitz, 2007), while some concentrated on the incremental value relevance of fair value disclosures for financial instruments (Petroni and Wahlen, 1995; Barth, Beaver and

Landsman, 1996; Eccher, Ramesh and Thiagarajan, 1996; Nelson, 1996) and particularly derivatives (Venkatachalam, 1996).

Using a sample of 229 firms scattered across 37 countries all over the globe, Lins *et al.* (2011) attempted to establish whether fair value reporting affected their risk management practices using survey methodology. Their results revealed that 42% of responding firms accepted that fair value standards for derivatives changed their risk management policies; especially if they used derivatives to reduce the volatility of earnings rather than cash flows and when the accounting numbers were highly important for contracting. Further, they reported a considerable decline in nonlinear hedging instruments and foreign exchange hedging strategies, while firms with active derivatives trading were affected the most by fair value reporting. Finally, they concluded that fair value reporting of derivatives had a “material impact on derivative use” while “sound hedging strategies have been compromised” (Lins *et.al*., 2011: p.525). Scholars often cite the positive involvement of disclosure in influencing the interpretation of fair values (e.g. Barth 2006; Landsman 2006). Additionally, some argued that fair value estimates are worthless without additional disclosure as these additional disclosures allow financial statements users to understand the relative quality of fair value estimates (Borio, Hunter, Kaufman and Tsatsaronis, 2004).

Some academics have pointed the finger at fair value accounting for financial instruments for being one of the principal reasons behind the financial crisis that originated in 2007 (Véron, 2008, Dontoh, Elayan, Ronen and Ronen, 2012). More recent papers have analysed the contribution from fair value accounting towards the credit crunch. The critics of fair value accounting claimed that fair value accounting was responsible for the financial meltdown by creating a vicious circle of falling asset prices. On the other hand, some scholars found no evidence supporting the theory that fair value accounting caused widespread sales of assets, resulting in their fair values diving (Laux, 2012). Further, Boyer (2007) argued that market valuations are based on emerging conventions and a series of uncertain future events. Hence, they never converge with fundamental economic value and therefore the adoption of market prices as fair values will induce a permanent inconsistency between the long-term value of a firm and its current market quotation; whereas historical costs are based on actual transactions hence tracking actual value creation. In summary, Eccher *et al*. (1996) suggested that financial statement users are better off by having both historical costs and fair values because “on average do bright-line rules produce information that is more useful than rules that require managers to exercise judgment in selecting reporting methods” (Healy and Palepu, 2001).

2.2.6 Historical cost accounting to fair value accounting

Numerous reasons have been proposed for why accounting standards are needed. Many attempts have also been made to develop a conceptual framework for reporting financial instruments (Laughlin and Gray, 1988; Gray *et al*. 1995). Historically, accounting standard setting process in the UK was carried out by open consultation through the issue of a financial reporting exposure draft; followed by the publication of a financial reporting standard. The need for derivatives disclosure and reporting was largely generated by the losses suffered by several corporate failures due to derivative trading. This section will briefly summarise the literature on the development of accounting for derivatives in the UK.

The period in which the theoretical concepts of financial reporting were tested through standard setting, especially regarding the issue of using current as opposed to historical costs (Georgiou and Jack, 2011), was from the 1970s to the 1990s. Further, Georgiou and Jack (2011) stated that historic cost was the default position for most firms; effectively balance sheets were presented using a valuation basis for fixed assets and historic cost for current items. In historical cost accounting, value is generated in business by purchasing inputs, transforming them according to a business plan, and selling the final products over cost; hence historical cost accounting does not report the present value of individual assets, nor the present value of possible outcomes from the business plan (Nissim and Penman, 2008).

Over the years, there has been a debate on whether the asset and liability approach requires measurement based on current values rather than historical cost (Miller, 1992). Historical cost, which is based on transactions, is used in traditional accounting; nonetheless as an alternative accounting can also be value-based, which means that revenues, expenses, assets and liabilities are measured at fair value (Heldesten, Lagerholm and Persson; 2013). Under historical cost accounting, initially no accounting entry is recorded for entering a derivative contract as it only reflects a promise between parties to the contract. Additionally, until the final settlement no changes in values are recorded in the balance sheet; hence no gain or loss is recorded in the income statement. Therefore, in the case of historical cost accounting, hedging decisions will not be influenced by accounting information (Chen *et al*., 2013). Unlike in fair value accounting historical cost accounting regime imply that, variation in market value of derivatives were not costly (Barth *et al*., 1995; Ryan *et al*., 2002). Further Coppens and Peek (2005) argued that earnings under historical cost accounting are more reliable and verifiable and less volatile; hence a higher fair value-orientation decreases the accuracy of forecasts.

Nevertheless, demand for international convergence, driven by investors' desire for high-quality, internationally comparable financial information that is useful for decision-making, led to the FASB and IASB's[2] ultimate goal of accounting standards convergence; a single set of high-quality, international accounting standards that firms worldwide can use for both domestic and cross-border financial reporting (Heldesten *et al*., 2013). Given the troubled history of accounting for financial instruments, it comes as no surprise that the IFRS fair value approach is controversial (Glaum and Klöcker, 2011). Assuming an optimistic view on historical-cost-based financial statements, particularly for contracting purposes, implementation of fair value accounting required theoretical support beyond the informational quality of fair value (Watts, 2003). Holthausen and Watts (2001) suggest that the historical cost model mainly originated from, and was influenced by, aspects of contracting and stewardship while fair value measurement referenced reporting objectives where information enabled investors to assess the amounts, timing and uncertainty of future

[2] Since the mid-1980s FASB, the US Financial Accounting Standards Board and IFRS, the International Accounting Standards Board have systematically substituted market-based measures for cost-based measures. (Hitz, 2007). The International Financial Reporting Standards were initially called International Accounting Standards (IAS). In 2001, they changed their name to International Financial Reporting Standards (Ernstberger, Krotter and Stadler, 2008).

cash flows. Hence, the theoretical pillar of the fair value paradigm was built around the information aggregation hypothesis.

Literature identifies the usefulness of the fair value approach from two viewpoints (Hitz, 2007). Firstly, from a measurement perspective, accounting should focus on measuring and reporting numerical information required by investors such as information related to value relevance of firms (Barth, 2000). Secondly, from an information perspective, financial reporting should present information capable of persuading companies and investors to revise their expectations.

The introduction of IFRS reduced the amount of discretion relative to prior accounting standards and made it less costly for investors to compare firms across markets (Covrig, DeFond, and Hung 2007; Armstrong, Barth, Jagolinzer, and Riedl 2010). Nevertheless, research indicates that the effects of IFRS adoption remain unclear (Panaretou, 2013).

2.2.7 Hedge accounting

One of the main purposes of hedge accounting is to reduce earnings volatility by visualising the risk management relationships from an accounting perspective, which constructs a link between items connected with risk and the hedging instrument; hence the gains or losses on hedged items and the hedging instruments are recognised in the same period (Comiskey and Mulford, 2009). “The logical basis for hedge accounting is that the hedging instrument should not have an accounting life of its own, but rather should be considered as part of a unified package: commitment plus hedge” (DeMarzo and Duffie, 1995. p.747). Moreover, firms are likely to be influenced by hedge accounting if they employ selective hedging based on profit orientated strategies of market rates (Glaum and Klöcker, 2011; Lins *et al*., 2010).

Prior studies on the effects of hedge accounting mostly analysed firms’ economic exposures to financial risk factors before and after implementation of accounting standards, mainly IAS 39 and SFAS 133. (Zhang, 2009). One of the principal points of the debate about the hedge accounting begins with accounting standards. From its inception in 1998, the US GAAP standard, SFAS 133, 'Accounting for Derivative Instruments and Hedging Activities' has met with fierce criticism from accountants, auditors and academics who say it's overly complex, restrictive and excessively burdensome. The same holds true for its counterpart IAS 39, 'Financial Instruments: Recognition and Measurement' (Osterland, 2000; Pollock, 2005; Glaum and Klöcker, 2011). Therefore, in the next section the arguments supporting and opposing hedge accounting will be discussed.

2.2.7.1 Advantages

The benefits of using hedge accounting on hedging have been investigated in several studies. (Ryan *et al*., 2002; Whittington, 2005). They identified that the primary advantage of hedge accounting is that it recognised the profit or loss of the effective portion of the hedging instrument and the hedged item in the same period, resulting in reduced cash flow and earnings volatility. Using financial firms' data, Barth *et al*. (1995) further iterated the importance of hedge accounting with the fair value approach. Further, a number of studies have examined the informational effect of hedge accounting. Melumand *et al*. (1999) showed that in the absence of hedge accounting, managers' hedging decisions could deviate from the optimal economic hedge firms would undertake with symmetric information.

Using derivatives use data from FTSE 350 non-financial firms for fiscal years 2003-2006 Panaretou *et al*. (2012) concluded that earnings are more predictable as the hedge accounting disclosures essentially turn private information into public information. They further showed that hedge accounting benefits are more noticeable for currency and interest rate hedgers. However, they concluded that direct empirical investigation of this is challenging due to lack of available data.

2.2.7.2 Issues with hedge accounting

Ryan *et al*. (2002) state that hedge accounting has disadvantages. However, they concluded that the advantages of hedge accounting clearly outweighed the disadvantages. Further other researchers have also identified several drawbacks of hedge accounting. Academics, auditors and even company accountants have criticized the complexity of hedge accounting rules (Osterland, 2000, Pollock, 2005, Doupnik and Perera, 2007, Hodder and Hopkins, 2012), saying that it could be excessively burdensome for firms (Glaum and Klöcker, 2011). Further Osterland (2000) and Pollock (2005) argued that hedge accounting in fact reduced the level of some firms' hedging as the strategies they would normally apply are not permissible under IAS 39. Additionally, Glaum and Klöcker (2011) said that IAS 39 hedge accounting rules influence managers' hedging behaviour.

Meeting the strict criteria to qualify for hedge accounting has shown to be challenging for many firms (Hughen, 2010). Despite using economic hedges to reduce the volatility of economic earnings, managers are unable to apply hedge accounting rules to reduce the volatility of accounting earnings (Revsine *et al*., 2002), hence increasing the possibility of selective financial misrepresentation. "These misrepresentations allow managers to achieve bonus goals" (Revsine *et al*., 2002: p.137), so diminishing the purpose of increased disclosure.

By analysing derivatives-related disclosures, Comiskey and Mulford (2008) observed five different reasons to why some derivatives are effective as economic hedges but cannot be designated as hedges for accounting purposes: (i) the considerable time and the cost involved in documentation and monitoring; (ii) the availability of highly effective natural hedges; (iii) broadening of new accounting standards; (iv) unavailability of qualifying hedges and (v) the increased risk of restatement that accompanies hedge accounting. Furthermore, they showed that without hedge accounting firms reported pre-tax earnings could range from a reduction of approximately 25% to an increase of 38%.

Additionally, Doupnik and Perera (2012) stated that the hedges might not be shown accurately in financial statements as a result of IAS 39 being too rule-based. However, Schiller and Lundh (2013) took a more positive attitude towards IFRS 9, which replaced IAS 39 in 2018. They suggested that IFRS 9 aimed to be a more principles-based standard, hence reducing the complexity of IAS 39 hedge accounting and reflecting more accurate risk management relationships. Assuming that both hedging and hedge accounting is costless, Pirchegger (2006) showed that hedge accounting could possibly exacerbate the moral hazard problem hence increasing agency costs.

They found three main disadvantages with hedge accounting: (i) hedge accounting measures the same exposure differently depending on whether it is hedged or unhedged, hence making comparisons difficult; (ii) even though deferral of gains and losses is attributable to the same period, these are initially reported in other comprehensive income rather than in net income; (iii) in hedge accounting, discretion is involved in deciding whether an instrument is a hedging instrument or not, therefore hedge effectiveness could influence earnings management. Nevertheless, they concluded that recognizing the effective portion of the hedging instrument and hedged item in the same period outweighed the above disadvantages as it created less time-series earnings volatility.

2.3 Derivatives use around the world

One of the primary aims of this study is to examine the effects of the use of derivatives amongst UK non-financial firms for the period 2005 - 2012. The empirical investigation provides in this thesis gives a heightened understanding of the role played by derivatives in UK non-financial firms' risk management policies. As the UK is one of the global leaders in finance with an advanced financial market structure, it is vital to understand how other developed and developing countries use derivatives. Therefore section 2.3.1 and section 2.3.2 will focus on reviewing the literature examining derivatives in the developed and developing world.

2.3.1 Derivatives use in developed countries

Academic literature on financial derivatives usage initiated in the early 1980s with the investigation of US firms (Nance *et al.*, 1993, Bodnar *et al*., 1995, Phillips, 1995). Since then several studies have examined the nature and the extent of derivatives use by non-financial firms. Most of these earlier studies (e.g. Bodnar *et al*., 1995;

Phillips, 1995; Mallin *et al*., 2001; El-Masry, 2006) were based on survey data due to unavailability of disclosed numerical data. However, due to the changes in the structure of derivatives reporting and disclosure, recent studies were able to capture the numerical disclosure of derivatives and so were based on quantitative methodologies.

Phillips (1995), in one of the early studies, included 415 US firms in his sample representing almost every sector in the country. This study investigated derivatives use in three different areas, namely managing financial risk, accessing financing sources and investment choices. It showed that the main purpose of using derivatives was financial risk management, and usage increased with the firm’s size. Additionally, he found that the smaller firms preferred to use traditional securities with entrenched options as well as asset-backed securities. These findings imply that using complex derivatives needs specialised knowledge, hence smaller firms tend to use common instruments for their risk-reducing activities. Bodnar, Hayt, Marston and Smithson (1995) examined derivative usage by US non-financial firms and confirmed the lack of derivative use among smaller firms. Another interesting finding of this study was that, even though derivatives could be used to speculate on market movements, in reality this was not a widespread practice and derivatives were most commonly used to reduce the volatility of cash flows. Their research data and their findings have contributed to derivative usage literature as their survey materials and methodology have been used in several similar studies subsequently.

Using fair value and the notional value of their off- and on balance sheet financial instruments, Berkman and Bradbury (1996) examined the corporate use of derivatives in 116 New Zealand firms. Since the New Zealand market is an emerging and smaller market compared to the US[3] their evidence showed different results to previous studies. As most New Zealand exports contain commodities such as

[3] As of the end of the first half of 2009 New Zealand Exchange had a combined market capitalization of $49.024 billion compared to $9,864bn in the US (World Federation of Exchanges, "Market highlights for first half-year 2010").

agricultural produce, wool and timber, New Zealand firms faced a relatively high level of interest rate and exchange rate risk and, as with the deregulation of financial

markets in 1984[4], the use of financial derivatives increased dramatically. Moreover, their study showed that the derivative use increased with firm size, leverage, the proportion of shares held by the directors, the pay-out ratio and the existence of tax losses in order to reduce the variability of their taxable income and maximize the present value of their tax losses while it decreased with the liquidity and interest coverage.

The increased popularity of derivatives all around the globe led to comparative studies to find the usage patterns among different economies. Berkman, Bradbury and Magan (1997) compared the derivative usage of 79 New Zealand non-financial firms with Bodnar *et al*.'s (1995) Wharton survey results[5]. Although the objectives of derivative use are similar in both countries, Berkman *et al*. (1997) provide evidence that New Zealand firms are in fact more active derivative users relative to their firm size. In addition, New Zealand firms follow a more extensive reporting procedure than their US counterparts. However, with the higher trading cost this greater use of derivatives shows the comparatively high-risk exposure of New Zealand firms due to a less developed financial infrastructure. Later Prevost, Rose and Miller (2000) compare New Zealand derivatives use with the US, UK and Germany and concludes that most New Zealand firms use over the counter forwards, options, and swaps to hedge interest rate and exchange rate risks similar to the larger economies.

Using survey methodology, Bodnar *et al*. (1998) extracted few reasons behind not using derivatives among non-financial US firms. Their figures show that 60% of non-derivatives using firms do not use derivatives mainly due to insignificant exposures

[4] With the constitutional and foreign exchange crisis in July 1984 the newly formed New Zealand government made major structural changes that constrained the operation of market forces. "Lifting interest rate controls was the first key reform of the new government. By March 1985, all wage, price, and interest rate controls had been removed, as had all foreign exchange controls and all ratio controls on banks. The exchange rate was floated with no subsequent foreign exchange intervention at all by the government" (Evans, Grimes, Wilkinson and Teece, 1996)

[5] The Wharton survey examined the derivatives usage by US non-financial firms. The survey was mailed in November 1994 to 2000 firms. Out of 530 usable responses, 183 used derivatives. They identified that derivatives use is not a widespread practice, particularly among smaller firms. Furthermore, the survey showed that the derivatives are most commonly used to reduce the volatility of the firms' cash flows.

to the risk. However, 14% of firms with potentially large exposures noted that they eliminated those exposures by operational diversification or risk sharing/shifting arrangements. A further 40% of the non-users put forward the cost/benefit argument as a secondary or tertiary reason for not using derivatives. In addition to that, perceptions of derivatives use by analysts and investors, the difficulty of valuing and pricing, concerns over accounting treatment and disclosure requirements, prohibition on their use at firm level, adverse prior experiences, and limited knowledge were other known reasons for not having a derivatives programme.

Using financial statement footnotes data to capture the information on corporate hedging decisions, Mian (1996) identified two possible reasons for not using derivatives for hedging purposes. He found that regulated utility firms are less likely to hedge compared with the firms in unregulated industries, hence implying that regulation could be a factor in preventing derivatives usage. Additionally, he concluded that the burden of mandatory reporting requirements could potentially influence derivatives use – at least for interest rate derivatives.

Bodnar and Gebhardt (1999) compared Bodnar *et al*.'s (1995) US survey results with derivative usage of 126 German non-financial firms in 1997. Consistent with the New Zealand results, German firms used derivatives more than US firms, supporting the argument that firms in smaller economies are exposed to more financial risk, especially foreign exchange and interest rate risk. The main focus of using derivatives for risk management largely differed in the two countries; where German firms focused on managing accounting results, as financial accounting statements play a major role in distribution of dividends to shareholders and in taxation, US firms concentrated on managing cash flows. Furthermore, their study showed that the German firms were much less concerned about matters related to derivative use as there are stricter policies over derivative use for German firms compared with US firms. In addition, their survey results found few important elements about not using derivatives. One was that there is a significant fixed cost involved with a hedging program and larger firms are in a position to spread this fixed cost over various transactions. However, despite the potentially larger benefits, this fixed cost makes derivative use uneconomical for small firms.

Bodnar, de Jong and Macrae (2003) mostly focused on the institutional differences between the US and the Netherlands on financial risk management practices when using derivatives. They suggested that the different derivatives use practices in the two countries were based on broad economic phenomenon rather than institutional differences. Consistent with previous studies, Dutch firms hedged more financial risk than US firms, confirming the foreign exchange risk exposure. In addition, their research showed that US firms focused more on accounting earnings when using derivatives, indicating their shareholder-oriented approach, while Dutch firms tended to take a stakeholder approach.

As different derivative instruments are designed for different purposes, it is imperative to study how these instruments were used in practice and the reasons behind using that particular instrument over another similar instrument. Using a sample of 372 industrial firms from Fortune's 500 list of the highest sales for financial year 1990, Géczy, Minton and Schrand (1997) examined the use of currency derivatives. From their sample around 41% of the firms used currency derivatives, which include forwards, futures, options and currency swaps. Furthermore, they suggested that firms with higher growth prospects and tighter financial constraints had a greater tendency to use currency derivative instruments. Firms with foreign denominated debt, foreign pretax income and overseas operations used currency derivatives, often acting as a substitute for hedging the foreign operations. They also suggested that the economies of scale in cost are an important factor in selecting currency derivatives. Additionally, they concluded that their sample firms did not use currency derivatives for speculative purposes.

Using the non-financial firms listed on the Stockholm Stock Exchange in 1996. Alkebdck and Hagelin (1999) compared derivatives use in Sweden with the findings by Bodnar *et al*. (1995) and Berkman *et al*. (1997) for the USA and New Zealand, respectively. Similar to Bodnar *et al*. (1995) and Berkman *et al*. (1997), Swedish non-financial firms utilised interest rate swaps to manage the interest rate risk, whereas OTC forwards and cross currency swaps were used to control the foreign exchange exposure. Additionally, using futures to manage foreign exchange risk was a common practice amongst Swedish firms. Another interesting finding of this study was that even though management of foreign exchange exposure was a widely used practice, only one out of six small firms used derivatives to manage equity, commodity or interest rate exposure. Further, they concluded that smaller firms tended to use exchange-traded products whereas larger firms used OTC products to a larger extent. Using a similar sample and a questionnaire, Alkebdck, Hagelin and Pramborg (2006) examined how derivative usage changed over the previous seven years. Even though derivatives usage increased by 7% to 59% there were no other significant differences in how derivative instruments were being used. Again, they noticed the high use of futures to manage foreign exchange exposure; nevertheless they could not give any economic explanations behind this practice. Furthermore, they noted that firm size-related differences grew smaller with time due to higher volatility in the markets, increased knowledge about derivatives and demands from shareholders, creditors, and legislators.

“Before the credit crisis that started in mid-2007, it was generally believed by top regulators that credit derivatives make banks sounder” (Minton, Stulz & Williamson; 2009: p.1). They investigated the use of credit derivatives by US bank holding companies from 1999 to 2005 and found the gross notional value of credit derivatives held by banks exceeded their loan portfolio due to customer-based activities and the role of the banks as an intermediary. Moreover, the main purpose of using derivatives was for dealer activities rather than for the hedging of loans. They provide two motives to justify their argument. First implication is banks cannot use hedge accounting for credit derivatives. The second implication is the adverse selection and moral hazard problems with the management. Their findings raise a question mark in relation to the extent to which the use of credit derivatives makes banks sounder. However, Said (2011) showed in his research not only a positive correlation between the performance of the banks and their use of derivatives, but between the efficiency of those banks and the usage of derivatives as well.

Risk management is a vital part of the insurance industry. The basic principle of insurance is diversifying the risk by risk pooling among a large number of policy holders. However, this traditional approach is not sufficient to fully eliminate the underwriting risk, hence the necessity of hedging. Cummins, Phillips and Smith (1997) investigated a large sample of 1207 life insurance firms and 2063 property casualty companies[6] who submitted their annual financial statements to United States National Association of Insurance Commissioners for 1994. They found that life insurance firms mostly used derivatives to manage interest rate and exchange rate risk, whereas property casualty insurers were focused on equity and foreign exchange derivatives markets. Moreover, their investigation revealed that life insurers use interest rate swaps, caps and floors, bond futures and foreign currency forwards; a larger number of property casualty insurers used equity calls/puts and foreign currency forwards. In addition, insurers appeared to be using derivatives as a part of equity income enhancement strategies. Another important finding was the significant difference between positions taken during the year and positions that remained open at the end of the financial year. Cummins *et al*. (1997) argued that, due to accounting reasons, managers of these firms had few incentives to engage in year-end derivatives positions.

Using a sample of 679 equity mutual funds included in the Morningstar Mutual Funds OnDisc, surprisingly Koski and Pontiff (1999) found that only 21% used derivatives. In addition to that, they found that the funds that did not use derivatives had a similar performance as the funds using derivatives. This evidence could lead to support of the Modigliani and Miller (1958) argument that hedging does not add value to a firm. However, Koski and Pontiff (1999) argued that the reason for that is that investment managers who use derivatives generally combine a derivative trade with non-derivative investments to balance their portfolio, therefore overall portfolio returns are equivalent to returns of the funds that do not use derivatives.

Aragon and Martin (2009) studied derivative use data from 1999-2006 in the hedge fund industry. Their sample included data from 250 investment managers. They found

[6] Casualty insurance mainly protects a person or business against legal liability for losses caused by injury to other people or damage to the property of others

evidence of directional call and put option holdings without the accompanying underlying asset (i.e. evidence of speculation). Additionally, this study identified that the professional investment managers used non-directional strategies such as straddle positions and protective puts in order to reduce the risk arising from speculating in derivatives. Furthermore, they concluded that the ability to time volatility, coupled with derivatives, gives a substantial opportunity to earn abnormal profits.

As this research investigates derivative use in the UK non-financial sector, looking at the previous literature based on derivative use in the UK is essential. Grant and Marshall (1997) surveyed financial directors and treasurers of the largest 250 UK firms for the years 1994 and 1995. Managing the foreign exchange and interest rate risks were found to be the two main reasons for using derivatives in both years. Swaps, forwards, futures and options were popular among users as liquidity played a vital role when selecting a derivative instrument. Additionally, credit rating was a significant factor in selecting the counter party, which resulted in a negligible defaults rate. Furthermore, a lack of specialised knowledge limited the use of more exotic derivatives even in the largest UK firms. Company policies, commercial reasons, risk aversion, understanding of the instrument and cost were the primary reasons that influenced the selection of derivative instruments.

Mallin *et al.* (2001) carried out the postal survey methodology of Bodnar *et al*. (1995) with 231 UK non-financial firms. Similar to Grant and Marshall (1997), the results showed derivatives predominately being used to hedge currency and interest rate risks. Swaps were the most used derivative instrument for hedging the interest rate risk while forwards were used to manage the currency risk. The primary objectives of using derivatives were reducing the volatility of the cash flows and managing the fluctuations in accounting earnings, while speculation or seeking arbitrage opportunities were minimal. The results of the survey found several reasons for UK non-financial firms not using derivatives, namely lack of considerable exposure to financial risk, the cost involved in maintaining a derivative programme, managing the risk by other means and finally a lack of knowledge about derivatives. Due to widely reported losses incurred by derivatives transactions, evidence mounted to support the idea that firms are concerned about the reporting procedures and evaluating the riskiness of their derivatives portfolio in addition to the accounting and disclosure requirements. Additionally, they observed that the size of the firm size is a vital issue for derivative use.

El-Masry (2006) used a sample of 401 UK non-financial firms to determine derivatives use and risk management practices in the UK market. Managing volatility in accounting earnings/financial ratios as well as on the balance sheet and the market value of the firm is considered a vital reason to use derivatives. Furthermore, his study revealed that firms used the spot rate at the beginning of the budget period as the benchmark for evaluating their foreign currency exposure and monthly reviewed their positions, using derivatives depending on their market view. With the gradual development of the derivatives market, options were the most common instrument for hedging followed by forwards, futures and swaps. In addition, their study indicated that the majority of firms set clear internal guidelines about the use of derivatives. Further, the results suggested that derivative usage is greatest among publicly traded firms and, organisationally, among multi-site and international firms. Further, he found that the most important reasons for not using derivatives were concerns over disclosure requirements and perception of derivatives use by shareholders, regulators and analysts. His results indicated that centralised risk management is an accepted approach among derivative users. This can be identified as a solution to a lack of knowledge about using derivatives.

The purpose of section 2.3.1 is to review the theoretical and empirical literature on use of derivatives by non-financial firms in developed countries. The discussion shows that currently there is no review that provides coherence and breadth to the literature, which does not provide an adequate discussion of the empirical evidence on the use of derivatives by non-financial firms in the UK. The current study provides extensive data and empirical evidence on the use of derivatives and supplies the level of detail that would help to understand the different results obtained in previous studies.

2.3.2 Derivatives use in developing economies

Currently, existing empirical research on derivatives is mainly focused on developed countries. Nevertheless, a few studies are dedicated to identifying the factors behind derivatives use in Asian, African, Latin American and other developing countries. Even though examining derivatives use in developing countries is not directly linked to the current research, in order to enhance the thoroughness of the literature review section 2.3.2 will examine how derivatives are involved in risk management in the developing world.

By examining the relationship between hedging through forwards, futures, swaps and capital structures for non-financial firms in Malaysia, Fazillah, Azizan and Hui (2008) reported that Malaysian firms hedge in line with agency cost, firm size and capital structure. Afza and Alam (2011) focused on Pakistani non-financial firms and concluded that firms with higher foreign sales are more likely to use foreign currency derivatives. In addition, they found that firm size, expected cost of financial distress and fewer managerial holdings are important factors with regards to foreign currency derivatives. Additionally, Muller and Verschoor (2007) highlighted the incompleteness and difficulty of obtaining data about derivative use in Asian firms; the exact nature of derivative positions is therefore usually unattainable.

Shu and Chen (2003) examined the determinants of derivatives usage and its impact on Taiwan non-financial firms and revealed that their derivatives use asymmetrically focused on currency and forwards derivatives. The electronic industry was the heaviest user while firm size and the ratio of long-term debt to total debt were the vital determinants of derivative use:

> *"implies the capability-willingness hypothesis: only large firms are affordable to engage in derivatives use due to the concern of economies of scale in establishing and maintaining expertise, and these firms demand more derivatives use when they face with high financial risk in debt structure" (Shu and Chen, 2003: p.473).*

“Hedging of exchange rates volatility turns more important for economies such as the Peruvian and other Latin American countries with a predominant financial dollarization.” (Martin, Rojas, Eráusquin and Vera; 2009: p.74). Their results showed that derivatives use by Peruvian firms was somewhat different to firms in developed economies. They found that even though firms were aware of foreign exchange and interest rate risks they did not carry out active risk management strategies. Interestingly, they found that the most influential factors in using derivatives were the degree of market knowledge and the level of training on derivatives. Additionally, they found that firms preferred to use OTC derivatives with banks, while there was hardly any interest in an organised derivatives market. They found that this was due to limited use of bonds and shares in cooperative investments; therefore, it is vital to develop capital markets first in order to grow the derivatives market.

Coutinho, Sheng and Lora (2012) examined currency derivatives use in Brazilian Bovespa Index listed firms between 2004 and 2010 and concluded that after the 2008 financial crisis their sample firms appeared to be using derivatives not purely for protection but for speculative purposes as well. There findings are consistent with Tufano (1996). However, Coutinho *et al*. (2012) reported a lower cost of capital for their sample firms after 2008, indicating that firms implemented better hedging strategies due to the scrutiny of investors and supervisory bodies. Further confirming their reduced cost of capital argument they stated that “correct use of hedging instruments genuinely does free up capital for the company”. However, even prior to the 2008 financial crisis, Saito and Schiozer (2005) provided evidence that Brazilian firms used derivatives for hedging. They also noted that the level of derivatives use was not significantly different to most other developing countries and that the exchange rate was the most managed risk, followed by interest rates, commodities and other risk. Furthermore, Brazilian firms focused on institutional and legal aspects when deciding to use derivatives rather than financial and economic factors.

Štulec *et al.* (2013) captured a few important factors behind derivatives use in Croatia. From their sample only 22% of the firms used derivatives, mainly OTC forwards, in order to manage commodity price and foreign exchange movements. Furthermore, they concluded that using forwards frequently was not surprising given the fact that there is no organized derivatives exchange in Croatia. Their results showed that hedging was the most important derivatives trading strategy for company profitability, with the greatest benefits indicating the risk averseness of Croatian managers. With regards to the characters associated with derivatives usage, firms in the economic sector appeared to be the most active derivatives users, while "public limited company and with larger share of top manager with university education tend to use derivatives to a greater extent" Štulec *et al.* (2013: p.66). Additionally, income was seen not to have an impact on derivatives usage, while ownership and the capital structure were the major deciders of derivatives use.

George, Ouma and Were (2013) investigated derivatives use in the Kenyan sugar industry and found that they only used forwards, swaps and options, as those were the only available instruments in Kenya and the use of foreign currency derivatives was limited to hedging purposes. Further, Sheikh (2011) reported that only 14% of the non-financial firms listed on the Nairobi Securities Exchange used derivatives. Different to most of the earlier literature, leverage, firm size, financing cost and growth opportunities did not appear to be important factors tied to derivatives use. Even though forward contracts were the most important instrument, their results showed that derivatives usage stabilised firm value rather than increasing it. A similar study by Muhrtala and Ogundeji (2013) examined derivatives and financial risk management among Nigerian non-financial firms and recorded a 16% usage level. The most pronounced usage appeared in firms in the oil and gas sector and firms with international operations; patterns of usage were driven by not only underlying economic factors but random choices as well.

Using the Triennial Central Bank Survey of OTC and exchange-traded derivatives activity, Mihaljek and Packer (2010) identified some insights into derivatives use in emerging economies. (i) They found that the daily turnover of total derivatives increased by 400% over the past decade and by the end of year 2010 it amounted to over 6% of total GDP. Further, this appears to be positively related to trade, financial activity and per capita GDP. (ii) Exchange traded and OTC derivatives in developing countries were traded in almost equal proportions while, unlike in developed economies, foreign currency derivatives were still the most traded type of derivatives instrument whereas the use of interest rate derivatives remained underdeveloped. (iii) Foreign exchange derivatives turnover was becoming gradually global, with cross-border transactions in less developed currencies increasingly taking place offshore. (iv) Trade and financial activity and per capita GDP were positively related to the growth of derivatives markets, with Korea, Brazil, Hong Kong and Singapore considered the largest derivatives markets in the developing world.

In addition to the above studies, Aysun and Guldi (2011) examined derivatives use in a series of developing countries and highlighted the fact that there was a declining trend in exchange rate exposure in those countries due to the increased use of derivative hedging. To summarise derivative use literature in developing countries (Muhrtala and Ogundeji (2013) stated that “Most studies conducted on the use of derivatives in Less Developed Economies revealed that large firms do not practice generalized use of the instruments.” Hence, there appears to be only a small proportion of companies using derivatives and then in small amounts. Although most of these studies support the notion that finance managers in these firms were aware of the existence of exchange rate and interest rate risks, most did not conduct any formal risk assessment procedures.

Recently, several authors tried to understand the reason behind the lack of derivatives use in developing world. Despite the liberalisation of free movement of financial assets, Kenyan sugar firms have not fully embraced the potential of financial derivatives. George *et al.* (2013) attempted to identify the rationale surrounding this and concluded that lack of knowledge and the limited availability of derivative instruments were the main reasons for the limited use of derivatives. Muhrtala and Mohammed (2013) emphasized the lack of knowledge and training in derivatives and identified these as a major impediment to development of derivatives use among financial firms in Kenya. In addition to the above reasons Muhrtala and Ogundeji (2013) found that scarce supply in the local market, the absence of an organized derivatives exchange, difficulty in evaluating derivatives and lack of clarity in tax regulations were among the main challenges for the derivatives use in Nigeria. Similarly, with regards to derivatives use in Croatia, Štulec, Baković and Dužević (2013) found that the lack of awareness of the benefits of derivatives led firms to lose the protection that derivatives could offer. They highlighted that the non-existence of an organised derivatives exchange and the dependence of managers on natural hedges were among other reasons for not using derivatives.

2.4 Uses of derivatives

In the early years of finance literature, the classical Modigliani and Miller proposition says that in an efficient market with an absence of taxes, bankruptcy costs, agency costs and asymmetric information financial contracts cannot alter firm value (Modigliani and Miller, 1958). However, it is believed that markets are not fully efficient in real life. The majority of risk management and the reasons behind using derivatives rationalised using Modigliani and Miller’s theory in a scenario where markets are not fully efficient. Therefore, the following section will examine the arguments associated with derivatives hedging as currently only limited number of studies available in the literature that investigated this during the 2007/2008 financial crisis.

2.4.1 Risk Management

Before examining the literature on derivatives use in corporate risk management activities, as different academic disciplines understand risk management differently it is vital to understand risk management in the broader sense. The main types of risk faced by firms fall into several categories, namely general, environment, industry, operational and financial risks (Fatemi and Glaum, 2000). Further they suggest that the general risk may initiate from the general environment in which the firms operate, such as legal or political issues. Each industry has its own risks. Primary manufacturing firms are naturally risky due to the cyclical nature of industry. Operational risk arises from day-to-day business activities. Moran (1997) found that the operational risk arises within the organisation itself. Financial risk can be identified as the risk emerging from change in foreign exchange rates, interest rates, commodity prices and credit risks (Fatemi and Glaum, 2000; Smith, 1995).

Risk management is vital for optimal portfolio management. Miller (1992) suggests that risk management is about minimising the volatility of firm performance and exposure to adverse events and losses. Considering the above explanations, financial risk management can be identified as the management of commodity prices, exchange and interest rate volatility and credit risk. Over the past few decades the world has changed rapidly where, at a click of a mouse button, transactions can be carried from one part of the world to another. With increased international business operations, firms face enormous amount of risk in different ways particularly related to economic and financial issues such as fluctuating interest and exchange rates and commodity prices. Hence, firms need to identify means that can be used in risk management. Some of these methods could include operational hedging strategies such as corporate conglomeration, diversification of product lines, geographical diversification and the use of earnings management techniques (Crouhy, Galai and Roberts, 2000). In addition to that, hedging with derivatives is one method that firms can employ to reduce their financial performance volatility, especially by managing market risk exposure[7]. For instance, if a local currency in a particular country falls significantly the cost of foreign raw materials may rise and could increase the likelihood of expected financial distress cost. A similar impact could be expected on the financial results of the company from increased commodity prices or interest rates. By using derivatives firms can reduce or eliminate the risk by passing it to another party. Further literature suggests that financial risk management in fact can increase firm value and decrease the risks of financial distress cost for a firm (Dhanani, 2000; Smithson *et al*., 1995; and Smith *et al*., 1985).

Additionally, existing empirical literature has focused on examining both the internal and external factors that influence risk management (Mian, 1996; Jalilvand, 1999;

[7] As discussed by Choi and Meek (2008) market risk exposure can be identified as the exposure which could cause by the unpredicted volatility of external macroeconomic risk factors, for instance interest rate, currency exchange rate, equity and commodity prices.

Haushalter, 2000; Bartram, 2002; Guay and Kothari, 2003; Judge, 2006; Schiozer and Saito, 2009; Bert *et al*., 2016).

2.4.1.1 Types of risk

2.4.1.1.1 Interest rate risk

There are numerous ways that changes in interest rates could have an impact on performance. Directly, the rise of the interest rate will adversely affect the firm debt portfolio, while indirectly an increase in interest rates will have a negative impact on firm performance as the disposable income of customers will fall resulting in a lower turnover. Further, suppliers have to pass on the additional cost incurred by the increase in interest rates, adding an additional burden to a firm’s performance. On the other hand, a fall in interest rates will affect interest income. Phillips (1995) suggests that interest rate risk is the most important of all the financial risks that organisations face. Further Faulkender (2005, p.936) stated that “firms face interest rate risk from two sources: the interest rate sensitivity of their assets and the sensitivity of their debt”. This means that if firms consider volatile cash flows to be costly, the goal of risk management is to compensate the final exposure of their debt interest to cash flows.

Further Faulkender (2005) and Singh (2009) both indicated that the larger and highly rated firms are more likely to have fixed rate debt and whether they prefer to swap from fixed to floating rate debt depends on their market view, while small, unrated firms usually borrow at floating rates and swap to fixed rate debt to reduce the interest rate exposure associated with it. Bartram (2002) examined the impact of interest rate risk on different industries and discovered that industries such as construction, industrial machinery, forestry and agriculture are particularly exposed to changes in the long-term interest rate. Additionally, he found that almost all the non-financial firms showed a higher exposure towards long-term interest rates compared with short-term interest rates.

There are several ways which the firms can manage the risk arising from interest rate volatility. Some of these involve the use of derivative contracts such as interest rate options, forwards, futures and swaps. Furthermore, the use of interest rate derivatives such as interest rate swaps and interest rate options to mitigate interest rate risk has been established by several researchers. In a large sample of non-financial firms from 47 countries, Bartram *et al*. (2011) found that 33% of these firms used interest rate derivatives; interest rate swaps appeared to be the most common instrument. Using a sample from Australia, Nguyen and Faff (2003) analysed the “adoption (decision to use)” and the “intensity (extent of use)” of interest rate derivatives and found that the motives behind the use of interest rate derivatives predominantly match with hedging theories, especially the financial distress cost theory (“to secure internal capital for future investment opportunities”). Further, they have seen a positive relationship between the use of interest rate derivatives and dividend pay outs, confirming the under-investment hypothesis.

2.4.1.1.2 Exchange rate risk

Firms are exposed to exchange rate risk if their business operations involve foreign currencies. Shapiro *et al.* (1985) defined the exchange rate risk as the variability of a firm's value that is due to the unpredicted exchange rate changes. They classified the foreign exchange risk under two broad exposure areas, namely accounting exposure and economic exposure. Accounting exposure can be identified by converting the firm's overseas operations, using the appropriate foreign currencies, into the home currency. The economic exposure of exchange rate risk is concerned about the overall value of a firm, which depends on the present value of its expected future cash flows. Any changes to exchange rates will lead to changes in future cash flows, and hence ultimately firm value. In addition to the above definitions, several authors have given different definitions to foreign exchange rate risk management (Rodriguez, 1981; Belk *et al*., 1990; Collier and Davies, 1985; Chiu and Foerster, 1997; Rahardjo and Dowling, 1998).

Since the collapse of the Bretton Woods system in the early 1970s, the fluctuation of exchange rates has become a major issue to the firms involved in international trade. However, continuous innovations have enabled firms to overcome this burden and in fact exchange rate risk is one of the most widely hedged corporate risks in the world (Yip and Nguyen; 2012). Studies documenting the effectiveness of using derivatives to manage foreign currency risk produced mixed results. However, a majority of them found a positive relationship between the level of exchange rate risk exposure and derivatives use.

Copeland and Joshi (1996) argued that in practice a host of other variables, such as demand for parts and products, supply of raw materials, regulatory frameworks, cost and productivity of labour and capital, all change similarly to exchange rates; therefore foreign currency risk is only a minor contributor to total risk. They therefore concluded that in real life there is no significant relationship between foreign currency exposure and the use of derivatives. Similar evidence was found by Hentschel and Kothari (2001). Nevertheless, they accepted that during their sample period firms did not have to disclose the magnitude of their derivatives positions under U.S. accounting standards; their conclusions were based on notional values and the crudeness of the information did not allow them to determine whether an individual firm was reducing or taking on risk with derivatives. As this study uses fair values, the above issue with notional values would not arise as, irrespective of firms taking on or reducing risk with derivatives, the outcome of the hedge should be reflected in the income statement or balance sheet immediately. Additionally, the empirical results provided by Bali *et al.* (2007) confirmed the non-existence for their sample of a positive association between foreign currency risk and the derivatives use. The level of derivatives usage is not of a size to be economically significant to a firm and geographical diversification, internal contracting and finally production management are shown to be the reasons behind their results. However, similar to Copeland and Joshi (1996) and Hentschel and Kothari (2001), their sample only contained the notional values of 410 US non-financial firms for fiscal years 1995-2001.

However, several studies documented the relationship between derivatives use and the exposure to exchange rates. Nguyen and Faff (2003) and Hagelin and Pramborg (2004) both found a significant reduction in foreign currency exposure from financial hedges using currency derivatives. Additionally, Chiang and Lin (2005) confirmed these results, stating that the use of foreign currency derivatives is an effective hedging strategy.

Anderson, Makar and Huffman (2004) specifically investigated whether ineffective derivative hedging in the past using foreign exchange derivatives helped to explain future derivatives use. Using derivatives usage data from a sample of 94 non-financial US multinationals, they showed that previously ineffective hedgers can be expected to modify their future use of foreign exchange derivatives accordingly. This demonstrates managers' reluctance to reporting ineffective hedges in their financial reports.

Yip and Nguyen (2012) examined the link between derivatives use and exchange rate exposure among Australian resources firms during 2006 and 2009. Their results indicate that even though more firms are exposed to fluctuating exchange rate risk since the financial crisis, there is lack of evidence that the use of foreign currency derivatives was more effective in easing exchange rate risks during the crisis as opposed to the pre-crisis period. However, they highlighted that this phenomenon could be industry specific and the use of derivatives to reduce the exchange rate risk could well be associated with the industry.

The above literature analysis shows that hedging exchange rate risk with derivatives produced mixed results. The current study therefore not only updates the empirical literature to the present, but also provides empirical evidence expressly related to exchange rate risk management amongst UK firms.

2.4.2 Theories behind risk management

As explained earlier, in the absence of market frictions Modigliani and Miller (1958) argued that hedging does not increase firm value. However later researchers have proved that in the real world, with the existence of market frictions, hedging can in fact have an impact on firm value. The managers are able to maximise firm value, consequently enhancing shareholder value through their operating and investing choices. There are various reasons that have been put forward to support the argument that risk management benefits and protect the shareholders' interests. The next section will examine the determinants and the theories behind using derivatives in risk management.

2.4.2.1 Expected costs of financial distress

Firms with higher expected financial distress cost could face direct or indirect costs on the firm (Smith and Stulz, 1985; Froot *et al*., 1993; Carter *et al*., 2006; Treanor *et al*., 2014). These could include higher contracting costs with banks, suppliers, customers and even its own employees. Therefore, one could argue that the firms with a higher probability of expected financial distress cost will have greater incentives to hedge their risks, anticipating larger benefits from hedging.

Consistent with the above assumption, Wall and Pringle (1989) found that firms with lower credit ratings are more likely to use derivatives, mostly swaps. Dolde (1993) reported that highly levered firms are very likely to use derivatives to mitigate the expected costs of financial distress. Consequently, the expected cost of capital encourages managers to reduce the prospects of expected financial distress cost by using derivatives hedging, thus aiming to reduce the variance of cash flows and increase firm value (Mayers and Smith, 1982; Smith and Stulz, 1985). Froot *et al*. (1993) and Stulz (1996) suggested that firms facing significant expected financial distress cost will choose to underinvest; thus, underinvestment cost is an indirect cost of financial distress.

Purnanandam (2008) had examined the empirical association between financially distressed firms and their risk management activities and found that highly leveraged firms had a lower tendency towards derivative usage. Nevertheless, opposite to this argument, Sang, Abu and Osman (2013) indicated that highly leveraged firms tended to hedge more as it would eliminate uncertainties in cash flows and provide some relief to the management and creditors.

2.4.2.2 Tax benefits

Smith and Stulz (1985) argued that the structure of the tax system can make it beneficial for firms to take positions in derivatives. Their argument is if the corporate tax rate increases with the income (convex tax function) firms' expected tax liability can be reduced by hedging. If hedging reduces the variability of the pre-tax value of the firm, as long as the cost of the hedge is not excessively large, then the expected tax liability of the firm is reduced and the expected post-tax value of the firm will increase, especially in economies where firms have the ability to carry forward their tax losses. Hence derivatives can be used effectively to reduce the variability of taxable income. Similarly, Keyes (2008) suggested that tax benefits from derivatives positions could be achieved by reducing the volatility of taxable income when (i) firms face an increasing marginal tax rate (ii) income smoothing could increase debt capacity, essentially increasing tax-deductible interest expenses. Using a sample of non-financial firms Nance, Smith and Smithson (1993) reported that tax was a significant determinant in a firm's decision to engage in derivatives transactions as their evidence showed that the firms with higher investment tax credits were highly likely to use derivative. Cummins, Phillips and Smith (1997) investigated the US insurance industry and found a significantly positive relationship between participation in a derivatives programme and carry forward tax losses.

Titman (1985) and Warren (2004) found evidence of the existence of tax gains from leverage and that managers could increase their firm's market values by selling forwards on their own equity. McDonald (2004) showed that this was not only true for forwards, but also for equity options. In a recent study Donohoe (2014) found that current tax expense and cash taxes paid decreased in the four years subsequent to implementing a derivatives strategy, therefore derivatives could considerably reduce firms' cash tax payments. Furthermore, Graham and Rogers (2002) estimated that the tax benefit from hedging with derivatives added approximately 1.1% to firm value. The above findings show that derivatives are not just a relatively common risk management tool, but they can also be used as a lucrative tax planning tool. With regards to tax saving, a recent study by Donohoe (2014) found that on average there was a 3.6% reduction in tax over a three-year period and a 4.4% reduction in cash effective tax rates subsequent to the introduction of a derivatives programme. However, he concluded that tax avoidance may not always be the primary reason firms use derivatives; nevertheless, they generate noteworthy tax savings. Furthermore (Graham and Tucker, 2006; McGuire *et al*., 2014) suggested that firms use aggressive tax planning strategies to generate tax benefits using derivatives.

2.4.2.3 Managerial incentives

Ammon (1998) and Gupta (2017) reviewed risk management theories and related empirical evidence and suggested that they can be divided into two competing approaches: (i) equity value maximising strategies (ii) strategies determined by managerial risk aversion. Literature discussions about the first category propose that hedging can increase the market value of firms while the second category of literature suggests that some managers prefer to maximise their expected utility rather than the market value of equity.

Managers can use derivatives for the purposes of maximising their own wealth. Smith and Stulz (1985) argued that corporate hedging decisions depend on the managers' compensation contract with the firm. As the management compensation often depends on accounting earnings, managers are encouraged to hedge, hence reducing the variability of firm value. Therefore, from the managers' perception, the best possible hedging decision is decided by their compensation contract and determined by the association between firm value and managers' end period wealth.

Furthermore, they suggested that managers could impose agency costs by involving in excessive hedging, which eventually could erode firm value.

Furthermore Huang, Su, Joseph and Gilder (2018) argued that while risk aversion of managers may cause firms to use derivatives, some firms may under-hedge, over-hedge or even not hedge, depending on how their wealth is tied to firm value[8]. Managers might be persuaded to reduce the firm's risk to levels inconsistent with investor value maximization if they have highly undiversified financial positions that are closely tied to their employer (Mayers and Smith, 1990). Hedging at firm level will be more likely to mitigate these conflicts of interest by linking management compensation to the equity price of the firm (Smith and Stulz, 1985). Further, Stulz (1996) stated that if there are no actual costs involved in managing financial risks, non-financial firms in particular do not necessarily need to allocate resources to reduce these risks as shareholders are in a better position to eliminate them by diversifying their portfolio. In contrast, firms closely held by owners who have a substantial proportion of their wealth invested in the firm have strong reasons to hedge; as a result, managers should mostly employ them to reduce risk rather than create derivative positions with speculative motives (Bartram, 2017).

In addition, Aretz, Bartram and Dufey (2007) suggested that the effect of reducing cash flow volatility by hedging was to ease asset substitution and underinvestment issues, paving the way to accommodate the risk aversion of undiversified managers as well as increasing the effectiveness of managerial incentive structures through eliminating unsystematic risk.

Even though the theoretical literature suggests that hedging activity is driven by managerial risk aversion (Smith and Stulz 1985), whether hedging activity driven by managerial risk aversion is a value-enhancing strategy is less clear (Panaretou, 2014). Tufano (1996) examined the association between management compensation

[8]In order to reduce over-hedging issues, Gay, Nam, & Turac (2003) and Huang, Ryan, & Wiggins (2007) suggested that firms should use more non-linear derivatives such as financial options

schemes and hedging ratios in the gold mining industry and found evidence that the risk-averse managers whose compensation comes as entitlement to shares in the firm will tend to hedge while managers with high option holdings manage risk less compared with managers with rights to firm shares. Supanvanij *et al*., (2006) argued that managerial hedging choices can be determined by whether their option holdings are in-the-money, out-of-the-money or at-the money. If options are out-of-the-money, increased volatility will simultaneously increase the probability of managerial wealth increasing, leading to less hedging. Conversely, if the option prices are at-the-money or in-the-money managers are likely to be risk averse and are likely to hedge ensuring that performance volatility decreased. This evidence shows that the type of compensation package can influence the risk preferences of the managers and therefore the hedging decisions they make can be motivated by the aim of optimising their own wealth rather than shareholder value.

Furthermore, several studies examined the agency costs and monitoring problems associated with derivative usage (e.g. Smith and Stulz, 1985; Tufano, 1998; Bodnar *et al*., 1998; Faulkender, 2005; Géczy *et al*., 2007). These studies reported a potential reduction in firm value at the expense of shareholders. Géczy *et al*. (2007) found that firms with weak internal governance structures are likely to engage in a directional view with derivatives. Faulkender (2005) documented evidence of speculation with interest rate instruments. Tufano (1998) suggested that manager confidence in handling derivatives-related transactions was associated with derivative usage. Further, he argued that low information asymmetry and low agency problem were positively related to derivative usage. “Overall, Fauver and Naranjo (2010) found that negative valuation effects with derivatives usage were associated with greater agency costs, weaker corporate governance, larger information asymmetry problems and poor monitoring.

Using a sample of UK non-financial firms, Huang, Joseph and Gilder (2018) investigated the association between derivatives usage and monitoring mechanisms and how they relate to managerial incentives and their investment decisions. She argued that firms with higher managerial incentives and monitoring mechanisms are making greater use of derivatives as monitoring mechanisms, which themselves protect the interests of both shareholders and managers while a negative relationship suggested risk taking to benefit managers rather than shareholders. In addition, if internally dominant boards make greater use of derivatives, this would suggest that derivatives are used to boost both managerial and shareholder interests. Supporting the above argument, Bartram *et al*. (2009) and Lel (2012) suggested that managers in firms with weaker monitoring mechanisms are more likely to use derivatives for their own benefit.

Similarly, examining the relationship between hedging and behavioural corporate finance is another important area in the literature. Using a sample of North American gold mining producers from 1990 to 1999 Adam, Fernando and Golubeva (2015) found that following speculative gains from derivative transactions managers increase their speculative activities while speculative losses do not reduce their speculative activities, which is consistent with the managerial overconfidence hypothesis. In addition, they suggested that successful selective hedging leads to overconfidence in managers; whereas failure of selective hedging attributed to bad luck.

Further, Adam *et al*. (2015) found that the degree of selective derivative hedging is related to past performance of derivative positions. Moreover, they found that selective hedging responds negatively to past profits from derivative transactions while positively associated with cash flows. Therefore, they suggested that managers' selective hedging decisions are based on the performance of derivative instruments alone rather than as an outcome of a derivative in a hedging relationship.

Alsubaie (2009) investigated hedging practices by S&P 500 non-financial firms for the year 2001 and found evidence to support that the overconfident CEOs often undervalue risk. Further, his empirical findings showed a statistically significant positive relationship with interest rate derivative usage and CEO overconfidence, while with foreign exchange derivatives this was a statistically insignificant positive relationship. Similarly, using a sample of S&P 500 firms from 2005 to 2010 Chou and

Lai[9] found that overconfident CEOs tend to hedge more than cautious CEOs. Further, their findings showed that overconfident CEOs hedge on more types of underlying assets; nevertheless there wasn't any significant relationship with the hedging instrument (ie. derivative). Furthermore, their results suggested a positive association between derivatives usage and firm performance during the financial crisis (2008 - 2010) compared to the pre-crisis period.

2.4.2.4 Underinvestment problem

A firm's investment decisions can make conflicts between shareholders and debt holders as debt holders have priority over gains, leading to underinvestment problems where managers disregard the net positive value (NPV) projects (Myers, 1977). As the managers have the ability to plan the financing and operation activities of the firm rather than the shareholders and the debt-holders they are in a better position to use derivatives hedging to overcome any underinvestment problems; thus agency cost (Mayers and Smith, 1987; Bessembinder, 1991). Froot, Scharfstein and Stein (1993) argued that hedging can add value to a firm as it harmonises the firm's financing and investment policies. They suggested that when external financing is costly for a firm it can benefit from hedging as hedging reduces the volatility of cash flows. This enable managers to coordinate the availability of internally generated funds effectively, hence reducing the underinvestment problem.

In addition to the above arguments, Bessembinder (1991) concentrated on hedging with forward contracts and provided evidence showing that it increases firm value by reducing the underinvestment, therefore allowing equity holders to capture a larger portion of the benefit from new investments. Morellec and Smith (2007) suggested that hedging can be used not only to control underinvestment issues but managers' ability to overinvest as well. In particular firms with lower market-to-book ratios commonly display larger costs of overinvestment, hence the managers of these firms are likely to hedge to control overinvestment tendencies.

---

[9] Undated manuscript available at http://sfm.finance.nsysu.edu.tw/pdf/2013pdf/061-1459878159.pdf. The most recent extant paper referenced in the manuscript is date 2011.

There are a number of empirical studies supporting the association between derivatives use and increased investment levels. Géczy, Minton and Schrand (1997) argued that hedging the cash flow volatility could reduce dependence on costly external financing, as well as reducing the underinvestment problem. Gay and Nam (1998) examined the underinvestment problem as a determinant of corporate hedging policy and found a positive relationship between a firm's derivatives use and its growth opportunities.

2.4.2.5 Avoidance of External financing and derivatives use

Several researchers found the evidence to support the relationship between derivatives and the avoidance of costly external financing. Nance *et al.* (1993) reported that firms with more investment options who use hedging instruments have lower leverage, suggesting that these firms have more growth options in their investment opportunity set. Using a sample of non-financial firms, Gay and Nam (1997) found that managers in the firms with low levels of liquidity and high growth opportunities tended to hedge more, using derivatives. Géczy, Minton and Schrand (1997) reported that firms with high growth opportunities, but low access to internal and external financing, were most likely to use currency derivatives. By conducting a cross-country analysis Lel (2012) found that firms with strong governance mechanisms tended to use currency derivatives to hedge overcoming costly external financing.

In addition to the non-financial firms, a number of researchers found similar results in the financial sector. Ahmed, Beatty, and Takeda (1997) found that among US banks, banks with less liquidity were more likely to use derivatives. Again, Cummins *et al*. (1997) reported that insurance firms that invested a larger proportion of their assets in illiquid assets such as real estate or private bonds were likely to hedge using derivatives[10].

2.5 Derivatives for other than hedging purposes

The previous sections showed that derivatives have been extensively used in risk management. In addition, these instruments can be used for purposes other than hedging; for example, for speculative purposes. Speculation with derivatives is where a firm uses a derivative to create extra exposure above the firm's underlying risk exposures so seeking to maximise the return on their investments. Firms can use also derivatives for partial hedging or to hedge selectively. That is where managers use their views of future financial price changes in order to determine the amount of exposure to hedge or to select the hedging instrument. Often evidence of speculation with derivatives comes to the public attention with high profile corporate losses or failures[11]. However, Adams and Fernando (2006) found positive cash flows from the use of speculative gold derivatives contracts among North American firms. A global survey by Lins, Servaes and Tamayo (2007) showed that half of the respondents admitted that they occasionally used derivatives for speculative purposes. Géczy, Minton and Schrand's (2007) survey showed that 7% of US firms who used derivatives speculated frequently while 54% speculated at least once.

Aragon and Martin (2009) studied derivative use data from 1999-2006 in the hedge fund industry and found evidence of directional call and put option holdings without the accompanying underlying asset. Additionally, this study identified that professional investment managers use non-directional strategies such as straddle positions and protective puts in order to reduce the risk arising from speculating by

[10] In order to examine the theories behind risk management the following hypotheses will be tested in chapter 5
Hypothesis 1: Higher expected costs of financial distress is positively associated with higher derivatives use.
Hypothesis 2: Firms with carried forward tax losses are more likely to hedge.
Hypothesis 3: Firms with higher underinvestment costs have a greater incentive to hedge.
Hypothesis 4: Greater firm size is positively associated with more extensive use of derivatives.
Hypothesis 5: Firms with alternative hedging instruments are less likely to use derivatives.
Hypothesis 6: Use of derivatives is associated with reduced cash flow volatility.
Furthermore, the rationales behind the variables included in the models and how they were measured will also be discussed in chapter 5. Finally, rationales and ex ante predictions for the variables being used are also examined in Chapter 5.

[11] Please see section 2.2.2.1 for examples of scandals and misuse of derivatives

derivatives. Furthermore, they conclude that volatility timing ability, coupled with derivatives, gives a substantial opportunity to earn abnormal profits. However, Fauver and Naranjo (2010) found that firms with greater agency and monitoring issues were more likely to speculate with derivatives and this would ultimately lead to a negative impact on firm value. Additionally, Faulkender (2005) provided evidence that firms may use derivatives for speculation; especially with the interest rate risk largely driven by the slope of the yield curve. He concluded that

“This is largely consistent with firms managing short-term earnings via their interest expense by modifying their liability interest rate exposure when the difference in the current interest payment between fixed and floating interest rates is large” (Faulkender, 2005: p.933).

Chernenko and Faulkender (2011) reported that firms appeared to use interest rate swaps to speculate when their compensation contracts are more performance sensitive to managing earnings. In addition, they concluded that an interest rate swap is an inexpensive method for firms to take directional hedging/speculation on interest rates movements compared with making changes to outstanding debt contracts. With regards to foreign currency derivatives Beber and Fabbri (2012) found that US non-financial firms’ managers adjust derivatives notional amounts considering the past foreign exchange returns making views on future currency prices. This is consistent with representativeness, narrow framing and overconfidence biases in behavioural finance literature. Furthermore, their results showed that inexperienced younger managers speculate more, which is consistent with overconfident managers being more open to higher risk arguments.

2.6 Value relevance

The value relevance of financial instruments and their fair value disclosure has been a main focus of several empirical studies concerning financial instrument reporting and disclosure (Eccher *et al.*, 1996; Barth *et al.*, 1996; Venkatachalam, 1996; Simko, 1999; Park *et al*., 1999; Mozes, 2002; Carter *et al*., 2006; Fauver and Naranjo, 2010; Bartram *et al*., 2011; Allayannis *et al*., 2012; Afza and Alam, 2016; Ayturk *et al*., 2016;

Jankensgard, 2016). The value relevance can be identified as the association between accounting numbers and the security market values or security prices (Amir, Harris, and Venuti, 1993; Ohlson, 1999; Barth, 2000) and requires demonstrating that whatever a firm does has a material impact on the drivers of firm value; ie risk, profit or growth. The majority of early value relevance studies examined US banks extensively, in particular the value relevance of fair value under different accounting standards (Eccher *et al*., 1996; Barth *et al.*, 1996; Park *et al*., 1999) and did not specifically limit themselves to derivatives. However, Venkatachalam (1996) investigated the implications of banks' fair value disclosures under SFAS 119 with regards to derivatives and found that the fair values of derivatives had incremental explanatory power over and above the contracted values of derivatives and helped to explain the cross-sectional differences of the banks' share prices.

Using a sample of 57 US publicly traded savings and loan institutions Schrand (1997) suggested that disclosure on derivatives is value relevant as the use of interest rate derivatives reduces the equity price sensitivity to interest rate changes. Seow and Tam (2002) empirically investigated the value relevance of credit exposures and fair value gains and losses on derivatives for 35 New York Stock Echange-traded banks and found the existence of information for returns. Using an equity valuation model, Wang *et al.* (2005) investigated the value relevance of US banks' derivative disclosures under SFAS 119 and 133 and indicated that the notional amounts and the fair value disclosures of derivatives are value-relevant.

Ahmed *et al.* (2006) analysed the value relevance of the recognised and disclosed fair values of derivatives before and after SFAS 133 for US banks. His results showed that the recognised fair values had significant explanatory power for the market value of the equity while disclosed fair values were found to be insignificant. Further studies have been carried out by Kolev (2008), Goh *et al.* (2009) and Song *et al*. (2010) on the US banking industry to investigate the value relevance of the fair value hierarchy required by SFAS 157. The result of Kolev (2008) showed that fair value estimates based on observable market prices are more value relevant than the fair value estimates based on indirectly observable data and the estimates based on subjective assumptions made by banks. Goh *et al*. (2009) found a significant positive relationship between the quality of auditors and the fair value estimates; hence fair value estimates are value relevant. Further Song *et al.* (2010) found that the reliability of fair value estimates increased with the strength of a firm's corporate governance, supporting the argument of Goh *et al.* (2009).

Gebhardt (2012) suggests that the additional fair value measurement data is incrementally value relevant for recognition and measurement data than for disclosure data, especially in the US banking context. The above findings of the value relevance literature strongly demonstrate that the fair values of banks' financial instruments are value relevant; especially there is evidence that the fair values of derivatives are value relevant in equity valuation (Venkatachalam, 1996; Seow & Tam, 2002).

Even though it is rare to find evidence of value relevance and derivatives use in non-financial firms (Gerhardt, 2012) there are a small number of studies examining this issue in the finance literature. Even among these studies very little research has focused on whether hedging achieves reasonable economic objectives (Carter, Rogers and Simkins, 2006). Simko (1999) examines the value relevance of the difference between fair values and their related book values of financial assets, liabilities, and derivative contracts under SFAS 107 for US non-financial firms. His results were somewhat different to the previously discussed results relating to the US banking industry. His results showed that the fair values of financial assets and derivatives were not value relevant while financial liabilities were significant in cases of substantial differences between fair values and book values. He argued that the recognised gains and losses of financial instruments of non-financial firms are negatively correlated to a proxy of changes in values of non-financial assets due to accounting rules, as SFAS 107 does not recognise gains or losses in the value of non-financial assets; hence financial instruments in their sample have a lower explanatory power. In addition to that, Jin and Jorion (2006) investigated the hedging activities of 119 U.S. oil and gas producers from 1998-2001 using the derivatives' notional values. Even though they agreed with the 'hedging reduces the firm's stock price sensitivity' argument, they concluded that hedging does not affect the market value of U.S. oil and gas producers. Carter *et al.* (2006) criticised their results, stating that Jin and Jorion (2006) selected a sample "by their own admission"; hence their results could be biased. Again, using notional values Guay and Kothari (2003) quantified the magnitude of firms' risk exposure hedged by interest rate, exchange rate and commodity derivatives and calculated that the median firm's derivatives portfolio, at most, generates only $15 million in cash and $31 million in value; hence "Corporate derivatives use appears to be a small piece of non-financial firms' overall risk profile". While acknowledging Guay and Kothari's (2003) results, the current study highlights the importance of investigating derivatives fair value disclosure as fair value outcome is directly linked with firms' accounting income whereas notional values only represent the nominal value of a derivative position.

Opposing the above argument, Allayannis and Weston (2001) found evidence suggesting that the effects of foreign currency risk on share prices depended on a variety of factors including derivatives use among US non-financial firms. Carter *et al.* (2006) carried out their research focusing on the US passenger airline industry and showed that the 'hedging premium' is greater than 5% and it could go up as high as even 10%.

Mackay and Moeller (2007) showed that using derivatives for risk management can add value when revenues and costs are nonlinearly related to prices among oil refinery firms. They added that the market rewards firms when they create value by hedging and penalises them when hedging destroys value. A study by Ameer (2009) examined the value-relevance of foreign exchange and interest rate derivatives disclosure practices in Malaysia between 2003 and 2007 and found a significant positive correlation between total earnings and the use of derivatives. Even though his findings seem to imply the value relevance of the disclosed notional amount of the derivatives their contribution to a firm's valuation is very little in the Malaysian context. In the same year, using a sample of Canadian non-financial firms listed on the Toronto Stock Exchange, Kanagaretnam *et al*. (2009) analysed the value relevance of the cash flow hedge entries in the other comprehensive income adjustments of the derivatives and found a highly significant negative relationship, indicating that cash flow hedges have no value relevance. However, Campbell (2015) recently found a negative relationship between unrealised cash flow hedge gains or losses with future gross profit; further this relationship only becomes apparent once a firm reclassifies its existing hedges into earnings. Furthermore, Campbell, Downes, William and Schwartz (2015) found that initially analysts do not correctly incorporate unrealised cash flow hedging gains; analysts correct their errors after the hedges have largely expired; and investors correct their mispricing at the same time; both analysts and investors can better process cash flow hedge information when managers provide forecasts. Hence, the current study identifies need for further studies in cash flow hedges prior to agreeing with Kanagaretnam *et al.* (2009) and provide a framework for future researchers.

Having reviewed the value relevance literature with regards to derivatives, it is important to note that the majority of value relevance literature on banks largely supports the view that financial instruments' fair values are value relevant to investors. On the other hand, it is not a surprise given the fact that banks' assets and liabilities mostly consist of financial instruments including derivative contracts. At present the existing studies concerning the value relevance of derivatives use in non-financial firms give mixed results and encourage towards studies in order to come to a concrete conclusion[12].

2.7 Accounting disclosure and the extent of the derivatives use

The influence of accounting on hedging strategies and the use of derivatives is a research topic that has attracted academic interest over the last few decades. The real economic costs and benefits of using derivatives and how current fair value accounting influences management decisions over accounting earnings can be significant (Chen *et al.*, 2013). Before the implementation of SFAS 133 and IAS 39

[12] In order to examine the value relevance of derivatives use the following hypothesis will be tested in chapter 6
Hypothesis: There is a positive relationship between firm value and the use of derivatives for hedging amongst UK firms.
Furthermore, the rationales behind the variables included in the models and how they were measured will also be discussed in chapter 6. Finally, the rationales and ex ante predictions for the variables being used in the value relevance study are also examined in Chapter 6

derivative instruments were considered to be off balance sheet items hence were not reflected in financial statements. Even the firms that revealed this information disclosed it as footnotes, hence disclosures were not uniform (Li and Stammerjohan, 2005). The introduction of these standards has created an intense debate over whether accounting of derivatives affects firms' risk management practices (Zhang, 2009).

> *"Adjustments in hedging behaviour can imply changes in the type of derivative instruments used, the hedging horizon, and the extent of hedging. In the extreme, firms may abandon their hedging program. Under any scenario hedging benefits decrease, as the use of derivatives is either associated with higher earnings volatility or becomes suboptimal in terms of risk management"* (Panaretou, 2012: p.117).

Investigating the periods surrounding IFRS adoption in the UK context, they provided evidence of more predictability of earnings, signalling a quality and homogeneity of information about derivatives use in corporate risk management.

2.8 Other benefits and determinants of derivatives use

The above section examined the main arguments for the use of derivatives. The next section will investigate other factors that determine derivatives use, including firm specific factors and corporate governance variables.

2.8.1 Firm size

The relationship between the size of a firm and derivatives use has been the subject of several studies. In the early literature Gruber and Warner (1977) argued that if the cost of hedging was proportional to the size of the firm and the bankruptcy costs were less than proportional to firm size then smaller firms had a greater incentive to hedge, indicating that hedging is a decreasing function of firm size. With the increased popularity of derivatives use all around the globe, this led to comparative studies to find the usage features in different economies. Berkman, Bradbury and Magan (1997) compared the derivative usage of 79 New Zealand non-financial firms using Bodnar *et al.* (1995) Wharton survey results. Although the objectives of derivatives use were similar in both countries Berkman *et al.* (1997) provide evidence that New Zealand firms were in fact more active derivative users relative to their firm size. Wysocki (1998) argued that smaller firms had a greater demand for derivatives to hedge as their equity prices and cash flows were more volatile. Further he argued that larger firms had the ability to diversify their business geographically and find other cost-effective substitutes for derivatives.

However, the majority of earlier studies consistently found that derivatives use was associated with the firm size (Phillips, 1995; Berkman *et al.*, 2002; Lievenbrueck and Schmid, 2013). Contrary to the Wysocki (1998) argument, Heaney and Winata (2005) concluded that larger firms had greater access to overseas capital market compared with smaller firms; hence the greater need to use derivatives to mitigate the foreign currency fluctuation risk. Bartram (2009) quantified this, stating that a one Standard Deviation increase in firm size increased the probability that a firm was a derivative user by 12%. More recently Jannickle and Louise (2012), Muhrtala and Ogundeji (2013), Mizerka and Stróżyńska (2013) provided evidence supporting the larger firms' derivatives use argument for Norway, Nigeria and Poland respectively.

2.8.2 Influence of corporate governance factors on derivatives use.

Over the last decade several studies attempted to investigate the impact of corporate governance on derivative use. Using a sample from 30 countries over the period 1990 to 1999, Lel (2012) found that weakly governed firms appear to use derivatives for managerial reasons, including "subjective managerial views about market conditions when deciding on a risk management strategy" (Lel, 2012: p.222). However, Bodnar *et al.* (1998) showed that outright speculation with currency derivatives is a fairly rare phenomenon. Interestingly, the findings of Huang, Zhang, Deis and Moffitt (2009) suggest a different opinion. They suggested that even though real income smoothing using derivative instruments enhanced firm value, the value improvement is more noticeable in weakly governed firms compared with firms with stronger governance mechanisms. Additionally, Borokhovich, Brunarski, Crutchley and Simkins (2004) provided empirical evidence indicating a positive relationship between the use of interest rate derivatives and the relative influence of outside directors, suggesting that managers do not benefit from corporate interest rate derivative use at the expense of shareholders. However, using a sample from the UK, Buckley and Van Der Nat (2003) emphasised the inadequate knowledge of derivatives among independent directors. Confirming this argument, Dionne and Triki (2005) concluded that the level of financial knowledge among directors was the main determinant of hedging. Using FTSE 250 UK non-financial firms' derivatives use data, Sang, Abu and Osman (2013) showed that executives with equity options preferred risk taking over hedging and elected not to hedge.

Nevertheless, Borokhovich *et al.* (2004) and Marsden and Prevost (2005) could not find empirical evidence to support the association between board composition and derivatives use. Both these studies only used outside directors to measure corporate governance in their analysis. Contrarily, Allayannis *et al.* (2012) found that firms with good internal corporate governance structures were rewarded with a higher premium in their hedging activities to reflect the risk management decision and its effectiveness. Therefore,

> *"without consideration of the complementary and/or substitution effect between different corporate governance mechanisms, the empirical analysis between corporate governance and the derivatives usage decisions is unlikely to be complete"* (Chen, Fan and Yang, 2014: p.324).

2.8.3 Cultural influence on derivatives use

There are few studies based on the impact of cultural influence on hedging decisions to be seen in the academic literature. Focusing on energy utility firms all over the world during the period 2000 to 2009, Lievenbrueck and Schmid (2013) highlighted a few novel ideas about derivatives use. They revealed that culture has a strong impact on hedging decisions. The firms in short-term oriented countries where quick results are highly prized are not only more likely to hedge but to hedge in higher volumes.

2.8.3.1 Transforming the developing economies through the use of derivatives

Derivatives changed the financial market place by offering new transmission channels and making significant changes to traditional transmission mechanisms (Vrolijk, 1997). On the other hand, these innovative transmission channels play a vital role in the growth of the economy through their crucial role of price discovery, market completeness and efficiency and ultimately risk management; hence they attract foreign capital flows in developing economies, resulting in the reduced cost of capital (Ifeanyichukwu, 2013). In the Zimbabwean context, Chagwiza (2013) showed the benefits of a derivatives market in the financially unstable Zimbabwean economy. He suggested that the introduction of a derivatives market in Zimbabwe would provide liquidity risk management, price discovery and enhancement of liquidity; hence it could be a solution to the Zimbabwean economic liquidity problem by attracting foreign investors and strengthening monetary policy.

2.9 Involvement of derivatives in the 2007-2008 financial crisis

Another emerging area of derivatives literature is the investigation of the impact of derivatives use on the 2007/2008 financial crisis. Even though most of the research in this area is based on financial firms, there are few studies available that addressed the contribution of the use of derivatives by non-financial firms to the financial crisis. Additionally, most studies on this topic can be mainly divided in two categories; (i), that what firm executives did right should be emulated and (ii) that what managers did wrong should not be repeated (Zeidan and Rodrigues, 2012). This section will briefly examine both these types of literature.

"Experts still debate what caused the credit crisis of 2008" (Stout, 2011. p.1). Many observers have suggested that credit default swaps contributed significantly to the credit crisis (Stulz, 2009). He summarised three fundamental reasons behind their arguments. The first argument is that credit default swaps and derivatives in general made possible the credit boom that finally ended in a crisis. The second argument is that financial institutions held huge notional amounts of their credit default swaps and those positions created a systemic risk. Following the collapse of Lehman Brothers in 2008, these exposures led to a crisis of confidence in financial institutions among market participants. The final argument is that the lack of transparency in the credit default swap market led some financial institutions to appear much stronger than they actually were, which threatened the whole financial system. However, against the above arguments, they concluded that credit default swaps did not cause the dramatic events of the credit crisis and in fact credit default swaps market worked reasonably well during the first year of the credit crisis. Additionally, they added that eliminating OTC trading of credit default swaps could further reduce social welfare. However, they acknowledged that many factors may have contributed to the 2007/2008 financial crisis including loose monetary policy; poor lending standards in the mortgage industry; the contribution of the rating agencies for failing to investigate the soundness of the securities they were rating; the relaxation of legal restrictions on banks' proprietary trading; the abandoning of traditional partnership structures and the shift of risk on to public investors by many Wall Street firms and stressed the importance of further studies in this area to build a concrete definite answer.

Titova and Girard (2012) analysed the impact of derivatives on the banking sector in 19 European countries during 2005 and 2010. By using normalised derivatives notional amounts, they found that derivatives reduced bank risk in the case of hedging. However, they could not find any impact on bank risk in the case of trading with derivatives. Conversely, for the fair value of derivatives used in their analysis they found an increase in bank risk for most types of trading derivatives, while providing mixed results for hedging derivatives. Stout (2011) argued that the credit crisis was not primarily due to changes in the markets but due to the changes in the legislation that removed the constraints on speculative trading in OTC derivatives.

According to the International Monetary Fund working paper, Dodd (2012) estimates that the direct losses to non-financial firms alone for using exotic derivatives were $530 billion. He emphasised several questions arising from these massive losses: (i) whether non-financial firms were speculating rather than hedging with these complex instruments; (ii) whether the derivatives dealers were acting within the regulatory framework when making the transactions and (iii) whether regulators were able to monitor these non-transparent markets effectively.

Stout (2011) highlighted the importance of studying the history of derivatives regulation in order to prevent a repeat of the disastrous credit crisis of 2008. Furthermore, the 2007-2008 financial crisis brought much needed regulatory attention to the OTC derivatives markets and to the way credit risk has been transferred (Baily & Elliot, 2009). Using data from Italian banking groups, Esposito, Nobili and Ropele (2013) observed a limited exposure to interest rate risk during the second half of 2008-2012. During that period their sample firms managed their overall interest rate risk exposure by restructuring balance sheet assets and liabilities and hedging with financial derivatives, contradicting the speculation argument. They also found that the interest rate risk and liquidity risk were both significantly correlated, suggesting that Italian banks followed an integrated risk management approach during the crisis. Allen, Kim and Zitzler (2013) confirmed the results using post-crisis US data and concluded that the main purpose of using interest rate swaps was hedging rather than speculation, as previously reported by some academics.

Risk management received significant attention during and after the 2007-2008 global financial crisis (Millo and MacKenzie, 2009). Subsequent empirical work criticised the failure of risk management mechanisms during the crisis (Lewis, 2008; Power, 2009). “Despite its dubious role during the global financial crisis of 2008, risk management has continued its expansion” (Huber and Scheytt, 2013: p.88). The current study examines why the use of derivatives for risk management still retains its momentum; and contributes to the critical debate on derivatives use during the 2007/2008 global financial crisis.

2.10 Poor current state of knowledge in derivatives use; especially in UK non-financial firms

> *"Academic research on the effects of financial instrument standards on non-financial firms is rare. Most studies rely on US data and perceptions. However, comparable data for firms reporting under IFRS is now available and waits for exploration. Few studies analyse the effects of financial instrument standards on the risk management activities of non-financial firms. The results of the studies are of limited economic relevance"* (Gebhardt, 2012: p.285).

Based on the extensive literature review and above statement it's evident that few of the empirical studies used annual reports disclosure with regards to the use of derivatives in the UK context. As explained in the literature survey, using survey data inherits the non-response bias associated in survey designs while using a binary dependent variable to proxy derivatives use does not represent the real extent to which firms use derivatives or hedging; these severely undermine the results. In order to fill these gaps this study identified three avenues. Firstly, Chapter 4 will examine the extent of derivatives use; secondly, Chapter 5 will examine the theories and determinants of derivatives use; finally, Chapter 6 will investigate the value relevance of derivatives use. Chapter 3 will evaluate the methodologies that can be employed to bridge these gaps.

2.11 Conclusion

The purpose of this chapter is to review the existing theoretical and empirical literature on the use of derivatives. It has revealed that currently literature does not provide adequate empirical evidence or discussion of the use of derivatives by UK non-financial firms under the IFRS accounting regime. In order to address the poor understanding in this area this study has identified several paths. Chapter 3 will further examine these routes in more detail.

The literature outlined in Chapter 2 is not a complete list of all possible theoretical explanations for determinants nor value relevance of derivatives use. Nevertheless, it provides the starting point for determinant and value relevance study. A comprehensive specification of research questions and hypotheses along with the rationales behind the variables are included in the models and how they were measured is explored in more detail in the chapters that follow.

In addition, an overview of the alternative explanations and hypotheses that can be seen in the literature is discussed in Chapter 3, while the deeper discussion on these is discussed on a chapter by chapter basis.

Chapter 3. Research methods and data sources

3.1 Introduction

This chapter provides the philosophical perspectives that steered this research; a review of the methodologies used in previous empirical studies on corporate risk management, hedging with derivatives and the value relevance of derivatives and an introduction to the methods used in the current research. In doing so it provides an overview of how the researcher has sourced and derived these methods. First, it discusses the conceptual background to the research followed by a discussion about the data collection and analysis. Thereafter, this chapter examines the research methods and variables used in similar previous studies. This approach builds the foundation for analysing: the extent of derivatives use; determinants of use; value relevance; and analysts' understanding of derivatives use. Therefore, this Chapter overviews the methods employed in Chapters 4 to 7 (inclusive). Much of the detail of method, however, is deferred to be covered in those Chapters.

3.2 Research Philosophy and conceptual framework

The researcher's philosophical assumptions about a subject are likely to influence the research questions asked and the interpretation of findings (Burrell and Morgan, 1979; Deetz, 1996). Although these assumptions usually remain unspoken in most studies, they affect the way researchers conduct the research (Berry and Otley, 2004; Saunders, Lewis and Thornhill, 2007; Creswell 2009; Neuman, 2011). There are number of research paradigms discussed in social research. For instance, Chua (1986) identified three common sets of philosophical assumptions

a) assumptions about knowledge (epistemology)

b) assumptions about the empirical world (ontology)

c) assumptions about the relationship between theory and practice (axiology)

Burrell and Morgan (1979) identified four sets of assumptions with regards to social science research; namely epistemology, ontology, human nature and methodology. Assumptions relating to epistemology discuss the limits and validity of the nature and grounds of knowledge; assumptions of an ontological nature consider the very 'essence of the phenomena under investigation' (Burrell and Morgan, 1979: p.1), while assumptions related to axiology examine the relationship between environment and human beings. Further, Burrell and Morgan (1979) state that the three assumptions have important consequences for the way we try to understand and gain knowledge about the world and are likely to point towards various methodologies.

3.2.1 Epistemological consideration

An Epistemological issue concerns the question of what is regarded as acceptable knowledge in a discipline (Bryman and Bell, 2015), justification in how we know and what we know (Brewer & Miller, 2003) and whether the social world can be studied according to the same principles as natural science (Bryman and Bell, 2007: p.15). Chua (1986) sub-classified the beliefs about knowledge as epistemological and methodological; epistemological assumptions determine "what is to count as acceptable truth by specifying the criteria and process of assessing truth claims" (Chua, 1986: p. 604), while methodological assumptions specify the research methods appropriate to validate the available evidence. Following these instructions methodologists create the appropriate research designs, which researchers can then deploy to extract the necessary knowledge for their research (Sarantakos, 2005).

3.2.2 Ontological consideration

Ontology can be defined as the 'science or study of being', and a system of belief that reflects an interpretation of an individual about what constitutes a fact; hence deals with the nature of reality (Blaikie, 2010). The research design starts without a right or wrong answer and, by considering the Ontological position which deals with the fundamental nature of existence, each research will filter for preferences in the researcher's views about the world (Dilts and DeLozier, 2000). Bryman (2001) categorised Ontology into two positions, namely positivism and constructionism, where positivism refers to a social phenomenon that has an existence independent from the performers within it while constructionism is a social phenomenon and both their meanings are continually being revised and changed through social interaction.

3.2.3 Axiological and methodological consideration.

Axiology refers to goals underlying a particular approach to science (Patterson and Williams, 1998). They divided Axiology into two types based on the goal, namely terminal and instrumental. Terminal goals refer to the ultimate aims of a specific paradigm while instrumental goals relate to the criteria by which specific research efforts will be evaluated. Further they highlight the importance of recognising the apparent overlap between Axiology and Epistemology. For instance, it is possible to categorise the type of knowledge generated as being an axiological rather than an epistemological. In reality, this reflects ontological commitments such as the belief that could change over individuals, culture and time.

Methodology is the philosophical framework which determines the researcher's own epistemological stand; hence the choice of research is often not only based on how society views the world, but also how the researcher intends to carry out their research as well as the choice of method (Marsh, 2002). In the case of social research, it has a diverse range of considerations that depend on how the social world should be studied. As Bryman (2007) pointed out, methods are not just neutral tools, but also they are linked with how the world imagines the link between different viewpoints about reality and how it should be observed. Research questions therefore determine the type of materials the researcher intends to gather (i.e. statistical data and opinions); the choice of statistical data or opinions will determine the methods.

In the current study, the research philosophies and methods used in the earlier literature to some extent guided the choice of appropriate methodologies. The key difference between previous studies and this one is the richness of the data, which allowed the exploration of the truth and the reality in greater depth than in previous research. The truth is an unfolding process where researcher must understand how it came into being and changed over time within the social structure. The research philosophy outlined in this chapter is aimed at accomplishing this task: to understand the use of derivatives from a simple to a more complex social framework.

3.3 Data and methodological frame work

3.3.1 Sample selection criteria and the data set

This study focuses on derivative usage amongst the UK's 350 largest non-financial firms as listed on the London Stock Exchange. Like previous studies, this study mainly focused on large firms because evidence suggests they have relatively more extensive and complex derivatives-based risk management programmes (Smith and Stulz, 1985; Hoyt, 1989; Sinkey and Carter, 1997; Bartram *et al.*, 2009). Further this analysis only covers non-financial firms, because literature suggests that there is a lack of understanding and empirical evidence about their policies and practices (e.g. Gebhardt, 2012). Furthermore, combining financial firms and non-financial firms in the same analysis will distort the results due to lack of homogeneity between their derivatives' usage, policies, processes, and management (Zhou and Wang, 2013).

This research examined the annual report disclosures for the period 2005-2012 (inclusive). In so doing, the study covered the pre- and post-financial crisis years. Most previous studies generalised their findings from sample data to the population. The primary advantage of the current data set is that it represents the population of the largest UK non-financial users of derivatives. Furthermore, this study includes a variety of different derivatives instruments such as interest-rate and cross-currency derivatives, forwards and commodity derivatives; and considers industry differences. Therefore, results show a more comprehensive picture of the derivatives usage before, during and after the 2007/2008 financial crisis.

I collected and analysed annual report data from 238 non-financial firms for the full investigation. Amongst these, 19 firms classified as non-users because they revealed no derivatives-related information. Through a process of manual data collection of the annual report disclosures, this study contributes substantial empirical evidence to the extant literature on size, complexity, sophistication, firm reliance as UK derivatives use received very little academic attention in contrast to US. In the first stage I hand collected the total fair value derivatives data from the balance sheet. In the second stage, I again hand-collected the disaggregated derivatives data according to (a) the IAS 39 hedging category and (b) type of instrument using the notes to the accounts section and further disclosures. As this process involved matching the total fair value derivatives with disaggregated derivative fair values, I was able to ensure a level of data accuracy which was unavailable in earlier studies. As five firms did not meet the strict reliability criteria, I used data from 233 firms with 1834 firm years as the final data-set; this is used to reveal (i) the proportion and (ii) the disaggregated fair value of derivatives. For the purpose of analysis the Industry Classification Benchmark (ICB) has been used to determine the industry of a firm (Appendix 2). In addition, proxies for determinants of derivatives use, as well as the value relevance study were collected from DataStream.

3.4 Approach and measures - corporate use of derivatives

Chapter 4 – *Extent of derivative usage* is the first empirical chapter in this thesis and focuses on describing the data using simple statistical analysis techniques, such as measuring frequencies and percentages. Further, calculated means and standard deviations assess the central tendencies and levels of dispersion. To obtain the degree of utilisation of derivatives, data collected from annual reports was analysed in several stages.

The first stage of the analysis focused on explaining the proportions of derivative users and how they differ amongst FTSE 100 and FTSE 250 firms. Information on derivative use fair values are generally reported in the financial statements (especially balance sheet) section of the annual reports. However, despite the fact that disclosure of derivatives is now mandatory, there is a large disparity in reporting practices of different firms. Therefore, initially identifying derivative users based on the year and grouping them by FTSE category using published derivative fair values will show the overall picture of derivative use amongst UK non-financial firms. Furthermore, this approach will simultaneously allow the exploration of the changes of derivatives users and non-users, especially during the 2007/2008 financial crisis. In addition, in-depth analysis based on reported derivative fair values was carried out to examine the economic impact of derivatives use in order to isolate heavy usage as well as unusual patterns of changes to fair values that could lead to severe economic consequences.

In the second stage, there was a further subdivision into instrument types (i.e. interest rate swaps, cross currency swaps, forward contracts, commodity derivatives and other derivatives) to identify the instrument level usage[13].In the third stage, the distribution of derivative users by hedging category was analysed. To carry out the analysis, derivative use proportions and their respective fair value figures were divided into their hedging categories (i.e. fair value hedges, cash flow hedges and net investment hedges).

The findings of stage two and three are further expanded upon in Chapter 5 and Chapter 6 broadening the understanding of determinants of derivatives use and the impact of derivatives on performance in more detail respectively. These two chapters will also investigate the determinants and value relevance of derivatives, both in aggregate, and disaggregated by instrument type and hedging category. Furthermore findings of chapter 4 will be used in the final empirical chapter of this thesis to investigate the extent to which derivatives usage is picked up for comment by equity analysts – the supposed professional experts as regards analysis of firm's firms financial reporting, positions and prospects.

The final stage of chapter 4 will explore further the understanding of the use of derivatives and investigate how derivatives activities and their reporting are carried out in different industries. This contributes new information to the field of derivatives research, which until now has been provided on an aggregated basis. Thus, the

[13] Even with the introduction of IFRS, disaggregating the total derivatives fair values in to different instruments and hedging categories is a cumbersome process due to differences in reporting process. In addition to the 'derivatives financial instruments' section under 'notes on financial statements', this information was included in 'Corporate governance', additional disclosure sections and in some cases as footnotes in various sub-sections including derivatives as a financial asset or a liability at fair value through profit and loss.

current study presents new insights into the hedging and speculation practices amongst UK non-financial firms.

3.5 Approach and measures – determinants of derivatives usage

The primary purpose of chapter 5 is to explore the determinants behind derivatives usage and, using IFRS data, to assess the theoretical arguments suggested in the literature related to the use of derivatives in UK non-financial firms. This is important because (i) currently no study has compiled a comparably comprehensive data set taken from UK FTSE non-financial firms to examine their derivatives use; (ii) very little is known about the impact of hedging on a company's financing policy due to a lack of empirical attention; (iii) currently there are no empirical studies that have investigated the determinants of hedging in the UK non-financial firms during the 2007/2008 financial crisis.

3.5.1 Variables of interest

One of the most common approaches for selecting suitable proxies for the determinants behind derivatives usage and the main explanatory variables is investigating what proxies have been used previously in similar studies. The current study also employed this approach; hence section 3.5.1.1 and 3.5.1.2 summarises the variables found in the related literature.

3.5.1.1 Dependent variables used in previous empirical studies of derivatives use

As the motivation is to find the determinants of derivatives use, a primary explanatory variable of interest would be a variable representing the use of financial derivatives by FTSE 350 companies during the study period. Previous empirical studies used two types of dependent variables (i) a binary variable (ii) a continuous variable, mostly notional value derivatives to represent the use of derivatives.

(I) List of studies using a binary variable

- Nance *et al*., 1993
- Mian, 1996
- Géczy *et al*., 1997
- Allayannis and Weston, 2001
- Cummins *et al*., 2001
- Allayannis and Ofek, 2001
- Graham and Rogers, 2002
- Borokhovich, 2004
- Purnanandam, 2008
- Bartram *et al*., 2011
- Campello *et al*., 2011
- Boyer and Marin, 2013

(II) List of studies using notional values of derivative contracts

- Tufano, 1996
- Berkman and Bradbury, 1996
- Allayannis and Ofek, 2001
- Allayannis and Weston, 2001
- Carter *et al*., 2003
- Purnanandam, 2008
- Nguyen and Faff, 2010
- Campello *et al*., 2011
- Magee, 2013

Both these types have pros and cons. Using a binary variable may represent the use of derivatives by a firm. However, it would not be sufficient to measure the usage as it will give the same weight to a heavy user and a light user. Using the notional value of derivatives brings only the hypothetical value of a derivatives position to an empirical study; hence evaluating the economic impact to the firm is impossible. Furthermore, due to some of the disclosure about derivatives in current and prior accounting standards being only voluntary, collecting a complete data set with accurate notional values is not practical. Therefore, study findings based on only one of these variables may not provide the full picture.

With the introduction of IFRS it is mandatory for firms to disclose their derivatives fair values using IFRS fair value hierarchy. The main advantage of using fair values for evaluating derivatives usage is that as fair values are market based measures, these allow the researcher to examine the economic impact of underlying reasons that drives the derivatives use. Further, in terms of empirical analysis on total derivatives usage, the researcher will be able to gather an accurate data-set as derivative fair values are reconcilable. A small number of studies have used fair values of derivatives to proxy the derivatives use.

(III) List of studies using fair values of derivative contracts

- Berkman and Bradbury, 1996
- Howton and Perfect, 1998

The current study employs two measures to capture the use of derivative instruments by FTSE 350 non-financial firms (i) an indicator variable that acts as a proxy for a derivatives user and which is set to one when a firm reports a derivative fair value in their balance sheet; and (ii) a continuous measure of derivatives use, namely fair value of derivatives. To distinguish firms with a high derivative usage from those with low usage, these fair values were scaled by total assets, giving a proxy for the extent of derivatives use. For the purposes of disaggregation by hedge accounting type, similar additional proxies were created to measure the usage of: (i) hedge accounting; (ii) fair value hedges; (ii) cash flow hedges; (iii) net investment hedge; and (iv) fair value through profit or loss.

3.5.1.2 Independent variables used in empirical studies of derivatives use

As discussed in the literature review, the main theoretical arguments of using derivatives are hypothesised to be the reduction in the expected cost of financial distress, tax benefits, underinvestment costs and external financing, reduction of cash flow volatility, economies of scale and the existence of alternative hedging strategies (This will be extensively discussed in Chapter 5 - *Determinants of derivatives use*). Based on the prior research and the theoretical underpinning, this study used several proxy variables to assess the determinants of non-financial firms' derivatives usage. The first variable is size which is a proxy for the economies of scale. Following Graham and Rogers (2002) and Bartram *et al.* (2011), a natural log of total assets was used to represent firm size. Smith and Stulz (1985) suggests firms in financial distress should have a greater tendency to hedge. The current study used leverage, defined as total debt divided by total assets (Lel, 2012), to proxy the financial distress. To examine the tax convexity theory developed by Smith and Stulz (1985), this study used an indicator variable equal to one if a firm carried forwards tax losses, proxied by carried forward net operating losses (NOLs). A similar variable was used in previous studies extensively (Nance *et al.*, 1993; Tufano, 1996; Géczy *et al.*, 1997). "Such variables imply that firms with existing NOLs have convex tax functions," (Graham and Rogers, 2002).

Liquidity and dividend dummy variables were included in the regression to validate the argument that hedging substitutes may reduce the need of hedging (Nance *et al.*, 1993). As with Berkman *et al.*, (2002) this study used a log of current assets minus inventory over current liabilities to measure the liquidity of a firm. Further Graham and Rogers (2002) argued that "dividend restrictions might allow a firm to retain sufficient liquidity to make hedging unnecessary" supporting Nance *et al*., (1993) argument. Hence above dividend dummy was added to the regression.

Underinvestment costs and the external financing argument was examined using three variables. Firstly, research and development (R&D) expenses. "Research and development (R&D) expense is a common proxy for a firm's growth options"

(Borokhovich *et al.*, 2004). This study used R&D expenses over total sales in regression models as the first proxy for the underinvestment cost argument. Géczy *et al*., (1997) found that firms with higher quick ratios make less use of currency derivatives. Borokhovich *et al.*, (2004) suggested this is because the quick ratio is a proxy for the availability of internal funds; hence this evidence can be interpreted as being consistent with derivative use as a means of reducing the underinvestment problem. The quick ratio, measured by the total of cash and equivalents and net receivables to total current liabilities, was used as the second variable to assess the external financing argument. Finally, similar to Lel (2012), financing needs were measured as the ratio of capital expenditures minus cash flows from operating activities to total assets.

Following Guay and Kothari (2003), this study examined whether derivatives use motivated by cash flow volatility management (proxied by net cash flows from operating activities over total assets). Their findings show the implications of derivative hedging for cash flow are somewhat modest. However, Bartram (2008) analyses the literature further and concludes that cash flow volatility is one of the main theoretical motivations for foreign exchange rate risk management.

It is important to examine the interrelation between variables to avoid the multicollinearity issue as well as issues arising from omitted variables; especially in time series multivariate analysis setting[14]. Baltagi (2005) suggests that by using a panel data-set researcher will be able to minimize the omitted variable issue; also panel data provides less collinearity, higher information variability as well as more degree of freedom. As the current study uses an unbalanced panel data set for the analysis multicollinearity is less likely to occur. However, where appropriate Pearson Correlation Matrix will be used to investigate the multicollinearity.

---

[14] Multicollinearity arises when two or more independent variables in a multiple regression have a highly correlated relationship leading to an increased standard error of the coefficients. This means that that coefficients of some independent variables may be found not to be significantly different from zero, while in fact without the presence of multicollinearity and lower standard errors, these coefficients might have been found to be significant.

3.5.2 Regression models – differences between derivatives users and non-users

3.5.2.1 Univariate analysis

To select the appropriate model for analysing corporate use of derivatives, I extensively examined similar studies in the literature; previous studies on empirical determinants of derivatives use have employed a similar methodological approach. This showed that the univariate analysis was widely used in the literature to compare the key variables of interest among derivatives users. Géczy, Minton and Schrand (1997) used both univariate and multivariate analysis to examine the derivatives use amongst 500 U.S industrial firms based on the highest sales for the financial year 1990. Their univariate results showed that currency derivatives users are statistically different from non-users with respect to investment growth opportunities, while substitutes for hedging, managerial wealth and tax proxies were not statistically different. Further, proxy variables for expected financial distress cost showed mixed results. Nance, Smith and Smithson (1993) compared means of hedgers and non-hedgers using T-statistics. Their results showed that hedgers had a significantly larger R&D costs while little difference in carry-forwards tax losses. Further, they did not find any significant difference in leverage or book-to-market value ratio. Haushalter (2000) focused his study on 100 oil and gas firms for the years 1992 to 1994. His univariate analysis included Wilcoxon sign-ranked tests for comparing differences in medians and Pearson correlation coefficient analysis to test the differences between derivatives users and non-users. In addition, several other studies used the univariate analysis approach for assessing the differences between derivatives users and non-users (Berkman *et al.*, 2002; Nguyen and Faff, 2003; Lievenbrück and Schmid, 2014).

Following on from previous studies, I undertook a univariate analysis to ascertain mean differences between the key factors that determine the level of derivatives usage.

The Wilcoxon-Mann-Whitney[15] test was used to assess differences between the underlying distributions of two populations; derivatives users and non-users.

3.5.2.2 Regression models - Determinants of derivatives use

Following the univariate analysis, the next stage is selecting suitable regression models for exploring the decision to use derivatives, and what factors determine their use. There are a number of studies examining the total derivatives use, predominantly in US firms using annual reports disclosure; several other studies focused on one or more derivative instruments or risk exposure. Table 3.1 provides examples of econometric models used in previous studies.

Table 3.1 shows that previous studies used two types of econometric models to investigate the determinants of derivatives use (i) models which use a binary dependent variable such as the logit model or probit model (ii) models which use a continuous variable such as the Tobit model. Section 3.5.2.2.1 and 3.5.2.2.2 review these econometric models in detail.

[15] The Wilcoxon-Mann-Whitney test is a non-parametric test which can be used to determine whether the two populations have identical distribution functions against the alternative hypothesis that two distribution functions differ; especially that a particular population tends to have larger values than the other. One of the advantages of the Wilcoxon-Mann-Whitney test is that it does not require the assumption that the differences between the two samples are normally distributed. In our study, initially we calculated the means of the variables and then carried out the Wilcoxon-Mann-Whitney test. This enabled us to minimise the effects of the extreme cases that could highly influence the results; especially considering the smaller number of non-users.

Table 3.1
Examples of regression models used in the literature – Determinants of derivatives use

Research	Data	Model
Nance *et al*., (1993)	169 Fortune 500 and S&P 400 firms for 1986	Logit
Mian (1996)	Currency and interest rate derivatives use in 3,022 firms for 1992	Logit
Géczy *et al*., (1997)	Currency derivatives among 411 Fortune 500 firms for 1991	Logit
Gay and Nam (1998)	325 users and 161 non-users for year 1995	Tobit
Howton and Perfect (1998)	Random sample of 451 Fortune 500/S&P 500 firms for year 1994	Tobit
Saunders (1999)	2,657 non-financial firms on interest rate derivatives for 1991,1993,1995	Logit
Guay (1999)	254 firms from 1990-1994	Logit
Haushalter (2000)	Commodity derivatives use in 100 oil & gas firms for 1992-1994	Probit
Nguyen and Faff (2003)	469 Australian non-financial firms from 1999 to 2000	Logit & Tobit
Borokhovich *et al*., (2004)	284 S&P 500 non-financial firms for year 1994	Tobit
Chiang and Lin (2005)	Taiwan non-financial Foreign currency derivatives users from 1998 to 2002	Logit
Bartram *et al*., (2006)	6,448 global firms from 2000 to 2001	Probit
Judge (2006)	FT500 UK firms for 1995	Logit
Birt *et al*., (2013)	341 Australian extractive firms for 2008	Logit
Velasco (2014)	74 Philippine firms for year 2007 or 2011	Logit
Lievenbrück and Schmid (2014)	Energy and utility firms from 2000-2009	Probit & Tobit

3.5.2.2.1 Logit Analysis

Section 3.5.2.2 shows when an indicator variable was used for measuring the hedging activities, a logit or probit model have been used in prior studies. Amemiya (1981) suggests that these two models give similar results when the data is not heavily concentrated in the tails. The current study modelled the firms' decision to use derivatives using logit analysis. The logit model has been extensively used to explore related questions (e.g. Haushalter, 2000; Cummins *et al.*, 1997; Graham and Rogers, 2002; Borokhovich *et al.*, 2004; Singh and Upneja, 2008; Bartram *et al.*, 2009). One of the main advantages of using the logit model is that it allows the researcher to examine the determinants of derivatives use even when there are no reliable measurements of derivatives usage data available as the logit model only requires an indicator variable as the dependent variable (i.e. whether a firm uses derivatives or not) to fit the model.

The logit model can be defined as follows

The logit model is a conditional probability model which uses the non-linear maximum log-likelihood technique to estimate the probability of firm failure under the assumption of a logistic distribution. The parameter estimates are obtained using the logit model's maximum likelihood method as derived in Gujarati (2003). The resulting model is of the following form:

$$P_i = E(Y = 1|X) = \frac{1}{1 + e^{-(\beta_1 + \beta_2 X_i)}} = \frac{1}{1 + e^{-z_i}} \qquad \text{Equation 3.1}$$

where P_i is the probability that firm *i* is a user of derivatives (Y=1) given a vector of attribute variables X (ratios, categorical or qualitative variables; for ease of here, I show just one variable X_i) for firm *i*, and the β_j are parameter estimates for each X_i. The function ($\beta_1 + \beta_2 X_i$) for such models is often simply denoted Z_i. The logistical function ensures that the probability estimates are bounded between 0 and 1.

In the equation 3.1 y^* is the unobservable latent variable (in this case proxy variable for hedging) and y represent the decision to hedge observed outcome. i represents the i^{th} observation and μ_i is the error term with standard normal distribution.

Size, leverage, expected financial distress cost, tax, liquidity, dividend pay outs, research and development, financing needs, quick ratio and cash flow volatility were used as x'_i (explanatory variables) in Equation 3.1[16]. The specific logit model estimated as regards derivatives usage is set out in Chapter 5

3.5.2.2.2 Tobit Analysis

Tobit models are widely used in the derivatives literature with a continuous dependent variable to measure derivatives hedging (Berkman and Bradbury, 1996; Gay and Nam, 1998, Howton and Perfect, 1998; Haushalter, 2000; Nguyen and Faff, 2002; Borokhovich *et al.*, 2004; Lel, 2012) (Table 3.1)

The Tobit model was defined as follows

$$y^*_i = x'_i \beta + \mu_i, \quad \mu_i \sim N(0,\sigma^2) \text{ where } y_i = \begin{cases} y^*_i, & if\ y^*_i > 0 \\ 0, & if\ y^*_i \le 0 \end{cases} \quad - \quad \text{Equation 3.2}$$

where y^*_i represents a latent continuous variable (in this case hypothetical optimal hedging ratio assuming all firms used derivatives for hedging purposes) and y_i is the observed extent of hedging in the i^{th} firm year. μ_i is the error term with a normally distributed mean of zero and a variance σ^2.

Haushalter (2000) suggested using the Tobit model over other models such as multivariate linear regression, as the Tobit model implies that the observed value of the dependent variable is censored at zero[17]. Due to frequent use of Tobit model in prior literature and the similarities of data used in the current study to Haushalter (2000), the Tobit model was used to assess the extent of derivatives usage. In this study even though the continuous dependent variable to measure derivatives use is not a censored variable, its distribution has the key characteristic with a censored variable, (with a number of observations at 0 for firms which do not use derivatives; so the use of a Tobit model is appropriate.

Similar to the logit model, in Tobit models I used size, leverage, expected financial distress cost, tax, liquidity, dividend pay outs, research and development, financing

[16] Detailed discussion of using these size, leverage, expected financial distress cost, tax, liquidity, dividend pay outs, research and development, financing needs, quick ratio and cash flow volatility as the independent variables will be included in section 5.2 of the thesis.

[17] For a detailed discussion on this with a practical example please see Haushalter (2000) p.129

needs, quick ratio and cash flow volatility as the explanatory variables[18] and μ as the disturbance term.

Having reviewed the econometric models used in the literature to investigate the determinants behind derivative use, the data requirements for Tobit models are clearly more demanding than for logit models. As this study has a comprehensive data set, it allows the researcher to use both logit and Tobit models in the econometric analysis. Therefore, the empirical findings should carry a higher weight.

3.6 Regression models – Value relevance of derivatives use

Empirical evidence on determinants of derivatives use can be used to determine whether a firm's hedging policy is consistent with the theoretical motives behind hedging. In a perfect market scenario, risk management is irrelevant to the firm value (Modigliani and Miller: 1958). Nevertheless, in a real world under imperfect market conditions hedging can increase firm value (Allayannis and Weston, 2001), although this argument is not universally accepted (Guay and Kothari, 2003).

In derivatives literature, the most frequently used method for determining the value relevance of derivatives use has been developed by Allayannis and Weston (2001), where they used firm value measured by Tobin's Q[19] as the dependent variable and derivative usage (foreign currency derivatives use) as the independent variable while controlling for other factors known to influence firm value. Their model was used by several studies, some with minor adjustments such as addition of economic variables (Lookman, 2004; Carter *et al.*, 2006; Jin and Jorion,2006; Fauver & Naranjo, 2010;

[18] Detailed discussion of using these size, leverage, expected cost of financial distress, tax, liquidity, dividend pay outs, research and development, financing needs, quick ratio and cash flow volatility as the independent variables will be included in section 5.2 of the thesis

[19] For each firm, they defined their Tobin's Q as the ratio of the market value of the firm to the replacement cost of assets at the end of the financial year. The replacement cost of assets is calculated as the sum of the replacement cost of fixed assets plus inventories. The replacement cost of fixed assets is calculated by inferring the vintages and depreciation pattern of in-place gross fixed assets. The replacement cost of inventories is the sum of the book value of inventories plus LIFO reserves. To calculate the market value of the firm's debt and equity, they have taken the market value of common stocks from COMPUSTAT. They further estimated the market value of preferred stock using the year-end redemption value. The market value of debt was constructed using a recursive methodology which estimates the maturity structure of the firm's long-term debt and accounts for changes in the yield on A-rated corporate bonds. Additionally, they assumed that other liabilities such as short-term debt has a market value equal to book value.

Bashir, Sultan & Jghef, 2013). Furthermore, a sensitivity analysis was carried out using Ohslon-based value-relevance approach.

3.6.1 Data sources and variables of interest

The current study focused on examining the value relevance of derivatives use based on the FTSE 350 non-financial firms listed on the London Stock Exchange from 2005 to 2012 using the approach adopted by Allayannis and Weston (2001)[20]. Independent variables were collected from the DataStream data base. As a proxy for firm market value, current study used the logarithm of total book value and market value of equity scaled by total assets plus book value of debt.

Firm Value = ln (market value of equity / book value of total assets).

Two variables were used to examine the influence of hedging on firm value: (i) an indicator variable with the value of one if a firm reported a fair value on the balance sheet date, zero otherwise; and (ii) a continuous variable to represent the extent of hedging, measured as the ratio of the total fair value of derivatives to total assets of the firm.

The literature has identified several other variables which could have an impact on a firm value. Therefore, controlling for these variables is necessary. In this study firm size, dividend pay-out, capital expenditure, return on assets, leverage and quick ratio selected as appropriate control variables (see section 6.3 for details). Furthermore, the current study used both univariate and multivariate tests to examine the influence of derivatives use on firm value.

3.6.2 Univariate analysis and Multivariate analysis

The univariate analysis allows the researcher to compare the differences between derivatives users and non-users using firm value. Significant differences in means and medians of firm values with regards to the above-mentioned control variables[21]

[20] Please see chapter 6.2 and 6.3 for detailed description of hypothesis development, variable selection and model specification.
[21] Other variables that could have an impact on firm value

were examined. In the multivariate analysis, regression estimates were used to assess whether derivatives users are valued at a premium.

The multivariate regression model used in the current study is

$$\text{Firm value}_{it}^{22} = \beta_0 + \beta_1(\text{derivatives use}_{it}) + \Sigma\beta_{it}\,(\text{control variable}_{it}) + \mu_{it} + \varepsilon_{it}$$

where control variables are given by size, leverage, quick ratio, dividend dummy and profitability.

The Ohslon regression model (basic model) used in the current study is

$$\text{Market value}_{it} = \propto_0 + \beta_1(\text{earnings})_{it} + \beta_2(\text{book value of equity})_{it} + \varepsilon_{it}$$

The market value is three months after the financial year end date for each firm. Earnings is the earnings of each firm at financial year end date. Book value of equity is the book value of equity of each firm at fiscal year end date.

The extended version of Ohslon regression model used in the current study can be stated as follows.

$$\text{Market value}_{it} = \propto_0 + \beta_1(\text{income from derivatives})_{it} + \beta_2(\text{adjusted earnings})_{it} + \beta_3(\text{net derivative fair values})_{it} + \beta_4(\text{adjusted equity})_{it} + \varepsilon_{it}$$

The market value is three months after the financial year end date for each firm. Income from derivatives is the net income from derivatives. Adjusted earnings is the difference between earnings and income from derivatives. Net derivative fair values is the net fair values of derivatives reported in the balance sheet. Adjusted equity is the difference between firm equity and the net fair values of derivatives reported in the balance sheet.

[22] In these regressions Firm value$_{it}$ refers to Tobin’s Q.

3.6.3 Empirical regression model specification

In the first stage, similar to Allayannis and Weston (2001), multivariate analysis was carried out using Pooled OLS regression with the decision to use derivatives as the main question of interest. Pearson correlation coefficient matrix was used to examine the presence of multicollinearity amongst exploratory variables. In addition to Pooled OLS regression, the fixed effects model was used to control for omitted variables that differ between firms but constant over time; fixed effects models use the changes in the variables over time to estimate the effects of the independent variables on the dependent variable. In the second stage, Pooled OLS regression and the fixed effects model were used to assess the extent of hedging and firm value; this approach enhances the validity and robustness of the findings. The Ohslon approach was used to explore the value relevance of different derivative instrument types (i.e. interest rate swaps, cross-currency swaps, forwards, commodity derivatives and other derivative instruments) and hedging categories (i.e. fair value hedges, cash flow hedges and net investment hedges).

3.7 Estimation model selection process

Throughout chapter 5 and chapter 6 appropriate tests have been applied to decide between pooled and panel specifications, and in the latter case, between models with fixed or random effects. Furthermore, in regression models pertinent standard errors were clustered at the firm level, and where appropriate year; and industry dummy variables were used to account for additional variability in pooled or panel-random-effects models.

3.8 Regression models – Analysts Chapter

Chapter 7 examines the extent to which financial analysts reference significant derivatives information in financial statements. The chapter uses a novel approach. It focuses on firms which reported the highest proportionate gains from derivatives use and those which suffered the highest proportionate losses from derivatives use; and uses simple content analysis to look at the extent of derivatives-related comment in analysts' reports on those firms.

3.9 Conclusion

This chapter provides an overview of the philosophical perspectives and a review of methodologies used to assess the extent and determinants of derivatives use, and value relevance of derivatives. It also introduced a novel approach to examining financial analysts understanding of derivatives, and discusses the data collection process and variables of interests and methods used in the current study. In addition, methods described in this chapter are also used for hypothesis development in follow-on chapters. Furthermore, detailed discussion of control variables and robustness checks will be carried out chapter-by-chapter.

Chapter 4. Extent of derivatives use

4.1 Introduction

As a result of the introduction of IFRS increased information with regard to fair value measurements of derivatives and corporate risk management policies made the use of derivatives and their reporting more transparent (Panaretou *et al.*, 2013). This increases the understanding of a firm's primary risk exposure and enhances the availability of potentially useful future earnings-related information which can act as a signal of management ability (DeMarzo and Duffie, 1995). These discussions have highlighted the importance of accurate information on derivatives use. Therefore the aims of this chapter is:

(i) to demonstrate the extent of derivatives usage among UK non-financial firms

(ii) to explore the changes; including pre-, during and post 2007/2008 financial crisis

(iii) to understand how derivatives usage differs between

   a. firms; and
   b. years

To my knowledge this is the first study to analyse derivative positions down to

   a. type of instrument; and
   b. hedge accounting category

Furthermore, a comprehensive assessment of derivatives utilisation laid the foundation for determining the characteristics of derivatives users and value relevance of derivatives use, and is presented in subsequent chapters of the thesis.

4.2 Proportion of derivatives usage

As discussed in previous chapters, many studies have reported that firm size is a significant factor in determining derivatives use (e.g. Berkman *et al*., 1997; Bartram *et al.*, 2009; Muhrtala and Ogundeji, 2013; Lievenbrück *et al.*, 2014). In this chapter firms are grouped into two categories based on size: (i) FTSE 100; and (ii) FTSE 250 indices[23]. Table 4.1 shows the proportion in percentage terms of derivatives users based on firm size. It shows that the total number of non-financial firms in the FTSE 350 increased to 238 from 210 during the study period. As the FTSE 100 and FTSE 250 indexes are market value based, the increased number of non-financial firms in the two largest FTSE indexes is consistent with the fact that the 2007/2008 financial crisis had a negative impact on the market value of financial firms. Further, from 2005 until the 2007/2008 financial crisis there was an increase in number of firms using derivatives; where the proportion of users in 2005 was 73.8%, by 2008 this had gone up to 85.9% with a significant increase between 2005 and 2006. The study finds two possible reasons for the 2005-2006 increase in derivative users. First, there was a 14% increase in the number of non-financial derivatives user firms in the FTSE 100 index. Second, it is possible that increased borrowing increased the risk leading to increased hedging.

Amongst FTSE 350 firms in 2008 the proportion of derivatives users peaked at 85.9%, before declining to 78.99% at the end of 2012. The proportion of derivatives users amongst the FTSE 100 firms remained high above 93% throughout the study period, peaking in 2009. In FTSE 250 firms, the lowest proportion of derivatives users (63.04%) was in 2005 while the highest was 80.13% in 2008 during the financial crisis. By 2012, the proportion had fallen to 71.7%. Moreover, the above data show that during the study period FTSE 100 derivative user proportions always exceeded the FTSE 250 derivative user proportions, supporting the notion that larger firms have a higher tendency to use derivatives.

[23] The FTSE 100 Index (UKX) comprises the 100 most highly capitalised companies listed on the London Stock Exchange and represents approximately 83-84% of UK market capitalisation. The FTSE 250 Index (MCX) comprises the next 250 largest listed companies, and represents approximately 15% of UK market capitalisation. (Above definitions and any changes to current series/indexes are published in http://www.ftse.com/products/indices/uk)

Table 4.1
Proportion of derivatives use among FTSE 350 non-financial firms

	FTSE 350			FTSE 100			FTSE 250		
Year	Non-financial firms	Derivative users	Derivative users proportion (%)	Non-financial firms	Derivative users	Derivative users proportion (%)	Non-financial firms	Derivative users	Derivative users proportion (%)
2005	210	155	73.8	72	68	94.4	138	87	63.0
2006	221	177	80.5	74	72	97.3	147	105	71.4
2007	224	184	82.1	75	74	98.7	149	110	73.8
2008	227	195	85.9	76	74	97.7	151	121	80.1
2009	232	193	83.2	76	75	98.7	156	118	75.6
2010	235	192	81.7	77	75	97.4	158	117	74.1
2011	238	192	80.7	79	73	92.4	159	119	74.8
2012	238	188	79.0	79	74	93.7	159	114	71.7

Table 4.1 reports the frequency and proportions of derivative instruments used by FTSE 350, FTSE 100 and FTSE 250 nonfinancial firms for financial year 2005 - 2012. Usage of derivatives is where a firm reported a fair value of interest rate swap, cross currency swap, forward contract, commodity derivatives or any other derivative instrument or combination of any of the derivative categories as at the end of the financial year end date.

Although these results cannot directly be compared with previous studies due to sample size and composition, they may be used to compare the variations in UK non-financial firms' derivatives use during 2005-2012 with other time horizons and jurisdictions. One of the first studies to assess derivatives use was carried out by Bodnar *et al.* (1995). They reported that in early 1994 65% of the responding US larger firms used derivatives. Later, in 1997 Berkman *et al*. (1997) examined the derivatives use in New Zealand, comparing their figures with Bodnar *et al.* (1995). They found that by the end of 1996, all larger New Zealand non-financial firms and around 70% of medium size firms in their sample were using derivatives. In contrast, only 30% of medium-sized United States firms in Bodnar *et al*. (1995) used derivatives. Considering the derivatives usage proportions, Table 4.1 results show that Berkman *et al.'s* (1997) findings are to some extent similar to current findings.

In recent years, there has been greater academic attention on derivatives use in developing economies (Shu and Chen, 2003; Selvi and Türel, 2010; Afza and Alam, 2011). Selvi and Türel (2010) compared the risk management practices of Turkish non-financial firms and banks listed on the Istanbul Stock Exchange for the financial year ended December 2006. They showed that only 35% of the largest Turkish non-financial firms and 85% of the deposit banks used derivatives, indicating that derivatives were not widely used by non-financial firms.

In Chapter 2, the literature review showed that examination of derivatives usage and related risk management practices by UK non-financial firms is still an understudied area. Using survey data Grant and Marshall (1997) found that around 89% and 92.8% of the FTSE 250 firms used derivatives in 1994 and 1995 respectively. Judge (2006) studied the derivatives use in the FT UK500 non-financial firms listed on the London Stock Exchange in 1995 using two methods: (i) survey; and (ii) review of annual report disclosures. In this study 67% of the firms disclosed in their annual reports that they used derivatives, compared to 78% according to survey respondents. Based on his findings, Judge (2006) suggested that annual reports disclosures have the advantage over surveys in that they provide more reliable information for a larger number of firms and do not have the non-response bias inherent in surveys. He added that, in contrast, annual report disclosures are often limited in scope and vary greatly by firm, hence they can be a major drawback in terms of providing the underlying reasons for derivatives use. El-Masry (2006) used surveys to examine the use of derivatives for managing corporate risk in non-financial settings. He reported that around 67% of their responders appeared to be using derivatives in early 2001. Even though direct comparison of Judge's (2006) results with current results may not reflect the real differences of derivatives usage due to sample size and reporting criteria differences, they are suggestive that over time there has been an increase in derivatives use proportions amongst UK non-financial firms.

4.2.1 Total derivative user percentages reported in other studies

In contrast to previous US studies in table 4.2, the current study showed a significantly higher derivative usage in UK non-financial firms (73.8% in 2005 and 85.9% in 2008). There could be several explanations for this. Firstly, majority of previous studies used a sample of firms to determine their results, whereas this study included all FTSE 350 non-financial firms listed on the London Stock Exchange. Secondly the response rate in previous studies that used the survey methodology was very low and subject to responder bias (Berkman and Bradbury, 1996); hence there is potential threat to the robustness and reliability of the results. By using the annual reports to extract data, we have reduced the chances of misclassifying a derivatives user as a non-user, thereby reducing responder bias.

Table 4.2
Proportion of derivatives use reported in other studies

Study	**Country**	**No of observations**	**Sample Year**	**Percentage (%)**
Current Study (2016)	UK	238	2005-2012	73.8 – 85.9
Bartram *et al*. (2009)	US	7292	2000 / 2001	60
Nance *et al*. (1993)	US	169	1986	62
Barton (2001)	US	304	1994-1996	72
Bodnar *et al*. (1998)	US	399	1998	50
Mian (1996)	US	3022	1992	26
Gay and Nam (1998)	US	486	1995	67
Allayannis and Weston (2001)	US	4320	1990-1995	37
Graham and Rogers (2002)	US	442	1994-1995	36
Guay and Kothari (2003)	US	413	1997	57
Howton and Perfect (1998)	US	451	1994	61
Guay (1999)	US	1975	1990-1994	37
Haushalter (2000)	US	292	1992-1994	51
Hentschel and Kothari (2001)	US	929	1993	63
Géczy *et al*. (1997)	US	372	1990	41
Bodnar *et al*. (1995)	US	530	1995	35
Allayannis and Ofek (2001)	US	378	1993	43
Nguyen & Faff (2002)	Australia	469	1999 / 2000	74
Berkman *et al*. (2002)	Australia	158	1995	56
Ivana *et al*. (1997)	Croatia	32	2011	22
Brunzell *et al*. (2011)	Nordic firms	112	2007	62
Ayturk *et al*. (2016)	Turkey	204	2007-2013	36
Mallin *et al*. (2001)	UK	231	1997	60

Table 4.2 reports examples of the studies examined the derivatives use in non-financial firms. Furthermore, name of the country under observation, number of observations, sample years and the proportion of derivatives users are also included in the table.

4.3 FTSE 350 Fair values of the total derivatives assets and liabilities

Table 4.3
FTSE 350 Fair values of the total derivatives assets and liabilities

	Derivatives Assets (£m)				Derivatives Liabilities (£m)			
Year	**N**	**Sum**	**mean**	**Sd**	**N**	**sum**	**mean**	**Sd**
2005	123	32,702.8	265.9	1,670.4	127	-36,639.8	-288.5	1,764.9
2006	149	25,113.8	168.5	1,018.0	143	-27,915.4	-195.2	1,059.0
2007	149	27,892.8	187.2	938.9	161	-30,910.5	-192.0	951.2
2008	149	69,715.7	467.9	2,474.7	174	-68,822.8	-395.5	2,242.9
2009	154	39,950.2	259.4	1,154.0	183	-38,304.5	-209.3	987.0
2010	152	40,408.8	265.8	1,229.4	179	-37,148.7	-207.5	1,105.4
2011	155	38,998.1	251.6	1,083.4	183	-34,062.0	-186.1	893.8
2012	156	34,995.5	224.3	784.5	177	-25,333.2	-143.1	560.0

Figure 4.1
Fair values of the total derivatives assets and liabilities (FTSE 350)

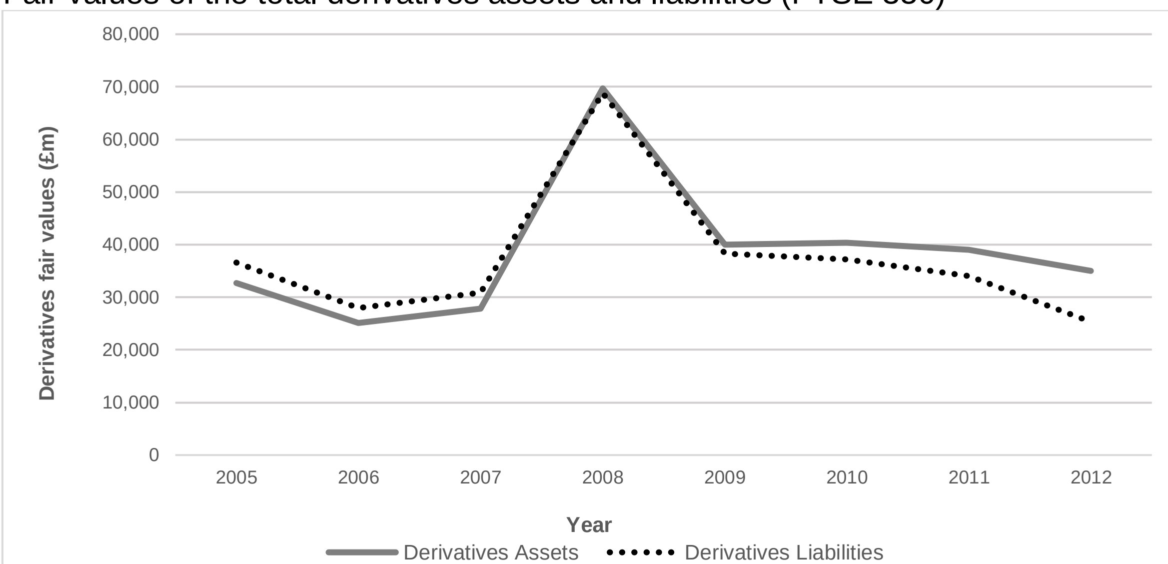


Figure 4.1 shows the variations in total fair value derivative assets and liabilities over time; before, during and after the 2007/2008 financial crisis. There are three interesting features regarding the data presented above:

1) Impact of the financial crisis
2) Liabilities exceed assets until 2008, at which point the trend reverses
3) The correlation between derivatives assets and derivatives liabilities

I elaborate on these themes below,

4.3.1 Impact of the financial crisis

The impact of the financial crisis on derivatives use can be studied via three distinct time periods: before, during and after the financial crisis in 2007/2008. It is essential, to recognise that causality worked both ways – the financial crisis upon derivatives' usage, and vice-versa – and that many argue that derivatives use was the most significant contributory factor for the financial crisis in 2007/2008. In this section describes the time trends from 2005 to 2012 including how it changed during the 2007/2008 financial crisis.

Figure 4.1 shows a growth of derivatives fair values until the financial crisis, peaking in 2007/2008 during the financial crisis, and, followed by a decline in their fair values returning to pre-crisis levels by 2012. The spike shows that the fair values of derivatives assets and liabilities nearly doubled during the financial crisis. As the fair values represent the market value of derivative contracts, one possible explanation for the spike is the rise in the market value of derivatives during the crisis. It is possible that due to sudden demand for risk management instruments, there was an escalation of new contracts while the values of existing contracts increased due to other economic factors. The decline in post-crisis derivatives fair values could be due to more focused regulatory factors and managerial attitudes towards derivatives use could have led to diminishing demand; hence the reduction in the fair values of derivatives assets and liabilities. Further, ending derivative contracts without fulfilling the obligations of the contract can be problematic[24], although managers have the option of not opening new derivative contracts once the contracts already in place expire. This can be another explanation for the decline in fair value assets and liabilities after 2008 as the managers closed existing contracts at the first possible opportunity and did not open new contracts.

[24] Another way to offset the outcome of a derivatives contract is to open a similar contract in the opposite direction with same contract features

4.3.2 Liabilities exceeds assets until 2008, at which point the trend reverses

Figure 4.1 shows that before the financial crisis derivative liabilities exceeded derivative assets, a trend which reversed after the crisis with derivative assets exceeding derivative liabilities. There are two possible explanations for this observation. First, it could be a result of change in the way firms manage derivatives-based risk management programmes. While the economic argument in favour of derivatives as an effective risk management tool, many argue that their negative effects have been neglected; e.g. managers taking derivatives positions with extreme degrees of leverage without considering the underlying threats (Barth and Landsman, 2010; Aebi, Sabato and Schmid, 2012). Another possibility is the market mispricing of derivatives. The adjustment of mispriced derivatives provides a some rationale for the fair value of derivatives assets exceeding liabilities after the 2008 financial crisis.

4.3.3 Association between derivatives asset and derivatives liabilities

Figure 4.2
Correlation between derivatives asset and liabilities

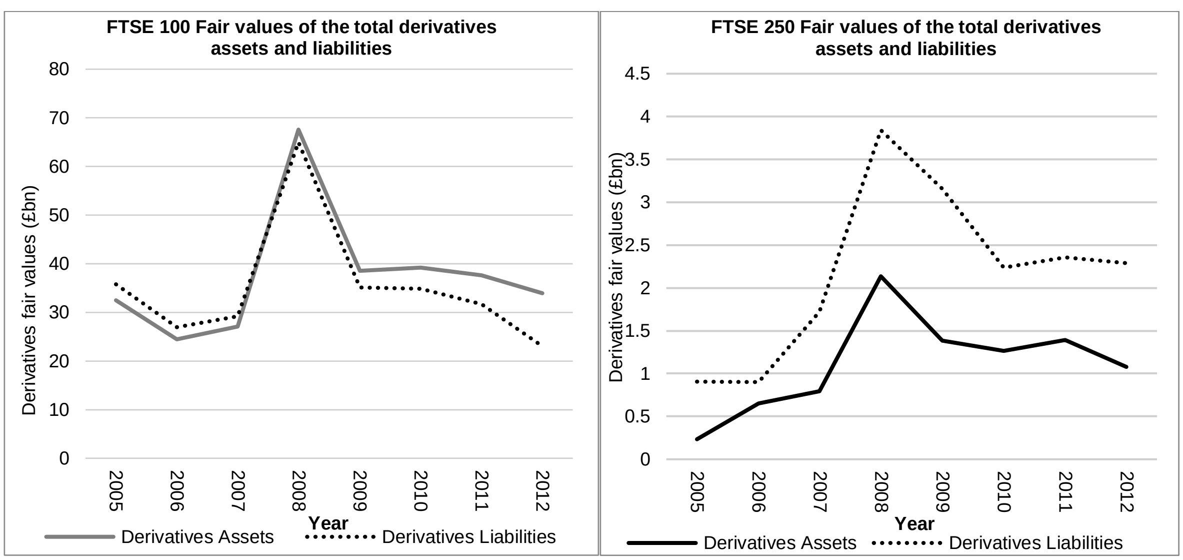


Figure 4.2 shows how derivatives assets and liabilities changed over time in FTSE 100 and FTSE 250 firms respectively. It further shows a near-perfect correlation

between derivative assets and liabilities for large and medium sized firms. This study proposes two possible explanations: (i) balance sheet hedging using derivatives[25]; and (ii) hedging against a hedged position or its results. Unlike banks and financial intermediaries, non-financial firms are less likely to involved in balance sheet hedging. However, figure 4.2 raised the question of whether non-financial firms in the FTSE 350 Index showed a similar behaviour with regards to balance sheet asset and liability management.

Another observation is the minimal difference between the derivatives fair value assets and the liabilities in FTSE 350 firms at the heart of the financial crisis. Before the financial crisis, the difference between the derivatives fair value assets and liabilities was around £2.8b and £3.9b. However, in 2008 this figure came down to its lowest value of £892.9m. Since then the gap has gradually widened at a steady pace, standing at £9.6b at the end of 2012. Firms in the FTSE 100 index showed similar time trends to FTSE 350 firms in their balance sheet derivative fair value assets and liabilities, indicating that FTSE 350 derivatives usage is mainly driven by FTSE 100 firms[26]. With regards to FTSE 250 firms, fair value liabilities in FTSE 250 firms exceeded assets throughout the study period. Further, the gap between derivatives assets and liabilities reached its highest during the financial crisis.

4.4 Derivatives use - total gross[27] fair value derivative assets and liabilities

Table 4.4 shows the totals of derivatives fair value assets and absolute value of their liabilities. It shows that in the UK, for non-financial firms, on average around 96% of total derivative fair values were held by FTSE 100 firms. In 2005, the proportion of total derivative fair values held by the largest firms was as high as 98.4%. It had decreased to 94.4% in 2012. These results might suggest that FTSE 100 non-financial firms reduced their use of derivatives proportionately more than similar firms

[25] Balance sheet hedging refers to opening a derivatives position with the intention of minimising the variation in balance sheet rather than hedging an underlying asset or a liability.

[26] Table 4.3 results show that over 94% of FTSE 350 derivative fair values belong to FTSE 100 category.

[27] 'Gross' refers to the addition of assets and liabilities in absolute terms.

in the FTSE 250. On the other hand, it could be argued that financial firms were actively concentrating on expanding their business to smaller firms as the derivatives market for larger firms is already saturated.

Table 4.4
FTSE 350, 100 and 250 non-financial total absolute fair value derivative assets and liabilities

Year	FTSE 350			FTSE 100				FTSE 250			
	No of firms	Sum (£m)	Mean	No of firms	Sum (£m)	Mean	(%)	No of firms	Sum (£m)	Mean	(%)
2005	155	69,342.6	447.4	68	68,204.9	1,003.0	98.4	87	1,137.7	13.1	1.6
2006	177	53,029.2	299.6	72	51,474.9	714.9	97.1	105	1,554.3	14.8	2.9
2007	184	58,803.2	319.6	74	56,287.9	760.6	95.7	110	2,515.3	22.9	4.3
2008	195	138,538.5	710.5	74	132,562.1	1,791.4	95.7	121	5,976.4	49.4	4.3
2009	193	78,254.7	405.5	75	73,713.6	982.8	94.2	118	4,541.1	38.5	5.8
2010	192	77,557.5	404.0	75	74,055.8	987.4	95.5	117	3,501.7	29.9	4.5
2011	192	73,060.1	380.5	73	69,306.1	949.4	94.9	119	3,754.1	31.5	5.1
2012	188	60,328.7	320.9	74	56,963.9	769.8	94.4	114	3,364.8	29.5	5.6

At this point, this study identifies two heavy derivative users; namely BP Plc and Royal Dutch Shell. The following section examines the contribution of these two firms towards the UK non-financial firms' total derivatives fair value assets and liabilities usage.

4.4.1 BP and Royal Dutch Shell derivatives use

Table 4.5
BP and Shell Derivatives fair values and their respective percentages

Year	FTSE 350 (N)	FTSE 350 Sum (£m)	BP/Shell (£m)	Compared to FTSE 350 (%)	Compared to FTSE 100 (%)
2005	155	69,342.6	51,605.1	74.4	75.7
2006	177	53,029.2	34,575.8	65.2	67.2
2007	184	58,803.2	31,202.2	53.1	55.4
2008	195	138,538.5	75,330.9	54.4	56.8
2009	193	78,254.7	34,854.6	44.5	47.3
2010	192	77,557.5	37,321.9	48.1	50.4
2011	192	73,060.1	32,642.7	44.7	47.1
2012	188	60,328.7	21,567.5	35.8	37.9

In financial year 2005, BP and Royal Dutch Shell alone accounted for 74.4% of the total absolute values of FTSE 350 derivatives. Furthermore, it was equivalent to 75.7% of the total FTSE 100 derivatives total absolute fair values the same year. However, this percentage rapidly declined throughout the financial crisis into the post-crisis period. In 2012, these two firms only accounted for 35.8% of the total absolute derivatives fair values of FTSE 350 non-financial firms. Compared to 2005, this was a significant decline. Nevertheless, the monetary value of the total absolute fair values involved was still enormous, exceeding £21.5bn in 2012. This study suggests two possible explanations. Firstly, it could be that the Shell and BP management changed their attitude towards derivatives after the financial crisis in 2008; hence changed their derivatives-based risk management strategies, resulting in the reduced derivatives fair value levels. Secondly, it could be that due to practical difficulties in terminating derivative contracts, managers may have delayed closure until the maturity dates; and once the contracts expired they simply did not open new positions, all eventually contributing to the reduction in derivatives fair values.

In addition, existence of these two heavy users increase the possibility of having an impact on the analysis in chapter 5 and chapter 6. However instances where study uses a binary variable in the regressions these two firms have no special impact to the analysis as it account for the same number of firm years as other firms. Furthermore, in all other instances variables related to BP and Shell will be scale by appropriate variables. Therefore, no major concern to the analysis due to magnitude of derivatives use in these two firms expected.

4.5 Distribution of derivative users by Instrument type

There are various types of derivative instruments. Some are contracts where the value of the contract is based on an index, rate of interest or price of a commodity such as gold. Furthermore, some derivatives are securities- or option-based while others are forward-based. Additionally, some are exchange traded while other are over the counter. This study has identified four main types of derivative instruments:

interest rate swaps, cross currency swaps, forwards and commodity derivatives. All other derivative types are pooled together to carry out the instrument-based analysis.

Table 4.6 shows how different types of derivative instruments were used during the study period. Further it provides their disaggregated proportions by FTSE 100 and FTSE 250[28] indexes.

Table 4.6
Proportion of different derivatives instruments users - FTSE 100 & FTSE 250

Year	FTSE 100 No of users (%)					FTSE 250 No of users (%)				
	Interest rate swaps	Cross currency swaps	Forward currency contracts	Commodity derivatives	Other derivatives	Interest rate swaps	Cross currency swaps	Forward currency contracts	Commodity derivatives	Other derivatives
2005	53 (80.3)	31 (47.0)	47 (71.2)	14 (21.2)	29 (43.9)	53 (62.4)	16 (18.8)	51 (60.0)	4 (4.7)	17 (20.0)
2006	53 (76.8)	34 (49.3)	54 (78.3)	16 (23.2)	28 (40.6)	60 (58.3)	21 (20.4)	62 (60.2)	3 (2.9)	21 (20.4)
2007	55 (77.5)	35 (49.3)	57 (80.3)	20 (28.2)	27 (38.0)	58 (53.7)	23 (21.3)	70 (64.8)	5 (4.6)	24 (22.2)
2008	58 (81.7)	34 (47.9)	61 (85.9)	24 (33.8)	32 (45.1)	67 (56.3)	23 (19.3)	79 (66.4)	8 (6.7)	28 (23.5)
2009	58 (80.6)	35 (48.6)	57 (79.2)	23 (31.9)	33 (45.8)	72 (62.1)	20 (17.2)	73 (62.9)	8 (6.9)	28 (24.1)
2010	54 (75.0)	34 (47.2)	58 (80.6)	22 (30.6)	33 (45.8)	72 (62.6)	22 (19.1)	80 (69.6)	8 (7.0)	27 (23.5)
2011	52 (74.3)	35 (50.0)	60 (85.7)	24 (34.3)	32 (45.7)	65 (55.6)	21 (17.9)	79 (67.5)	10 (8.5)	28 (23.9)
2012	52 (73.2)	38 (53.5)	59 (83.1)	22 (31.0)	27 (52.1)	56 (50.0)	22 (19.6)	76 (67.9)	9 (7.1)	27 (24.1)

Table 4.6 shows that, in FTSE 100 firms, forwards currency contracts[29] were the most commonly used instrument in the periods 2006-2008 and 2010-2012, whereas in years 2005 and 2009 this was interest rate swaps. In FTSE 250 firms, interest rate swaps were the most widely used instrument type in 2005, while forwards took the

[28] To obtain the proportions and relevant fair values under different instruments and hedging categories I hand collected total derivatives fair values further disaggregated using the quantitative and qualitative disclosure from the annual reports. This led to reduce the full data set to 233 firms for the descriptive study due to an inability to disaggregate the fair values into different instruments and hedging categories. Therefore, from this point onwards, when the study focuses on the disaggregated data it only references the calculations based on 233 firms. However, for the instances where total derivatives use was involved the study used the total number of FTE 350 non-financial firms listed on the London Stock Exchange (238 firms).

[29] Also referred as forwards.

lead in the remaining years. Further, commodity derivatives were the least used instrument in both FTSE categories; in FTSE 100 firms, this figure varied between 21.2% and 34.3%. However, in FTSE 250 firms it was as low as 2.9% in 2006, increasing to 8.5% in 2011.

Table 4.6 shows the proportion of different derivatives instruments users, and figures 4.3 to 4.5 examine the fair values with respect to these instruments. This is important because in some cases even with less number of derivative users, the proportions of total fair values were higher (e.g. commodity derivatives).

However, in terms of the total absolute fair values, commodity derivatives were the most widely used in FTSE 350 firms throughout the study period; though this value was mainly driven by the two leading FTSE 100 oil and gas companies: BP and Shell. In FTSE 250 firms, total commodity fair values were the smallest in all the years concerned. In addition, during the period 2007/2008, when the credit crunch was at its peak, the total absolute fair value of forwards was the greatest in FTSE 250 firms, while in the other years fair values of interest rate swaps or cross currency swaps were the highest. Further, since fiscal year 2006, fair values of interest rate swaps have gradually increased in medium-sized firms.

Figure 4.3
Total absolute value of FTSE 350 different derivatives instruments (£ billions)

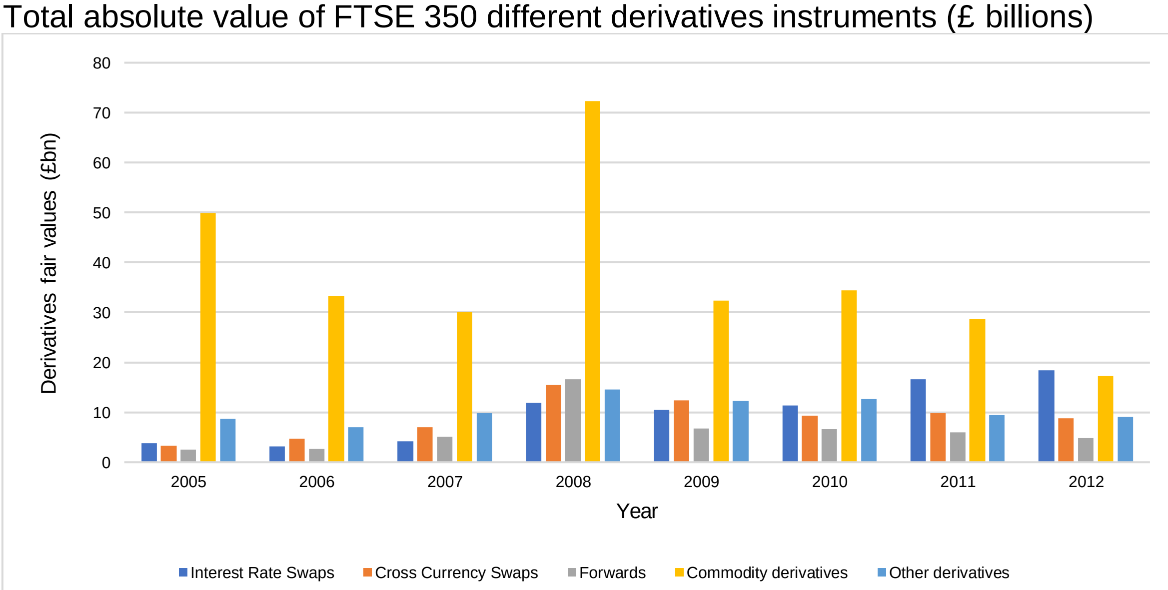


Figure 4.4
Total absolute value of FTSE 100 different derivatives instruments (£ billions)

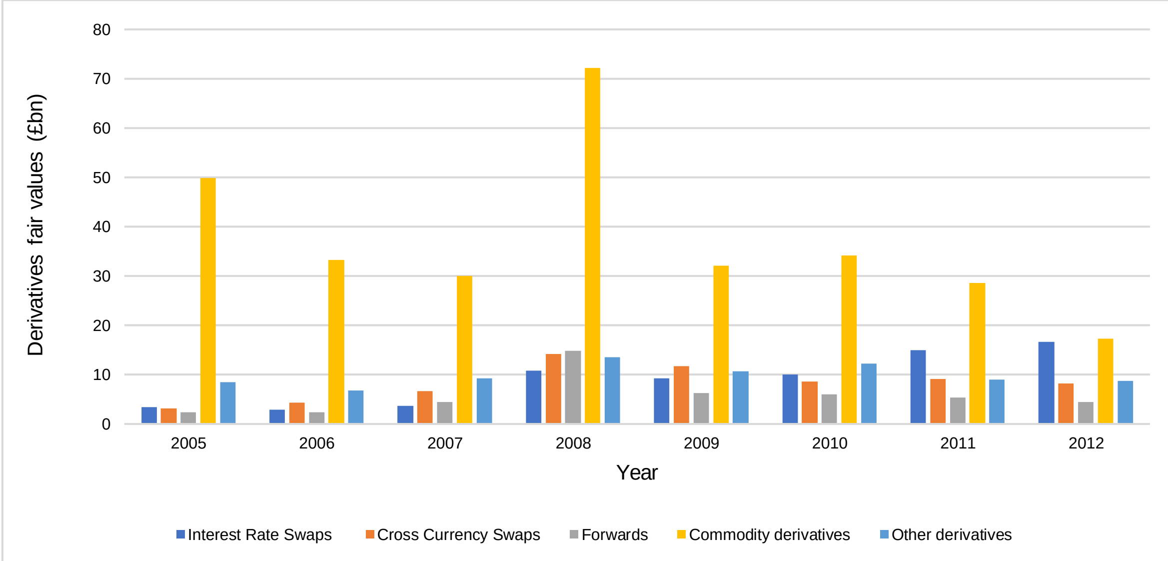
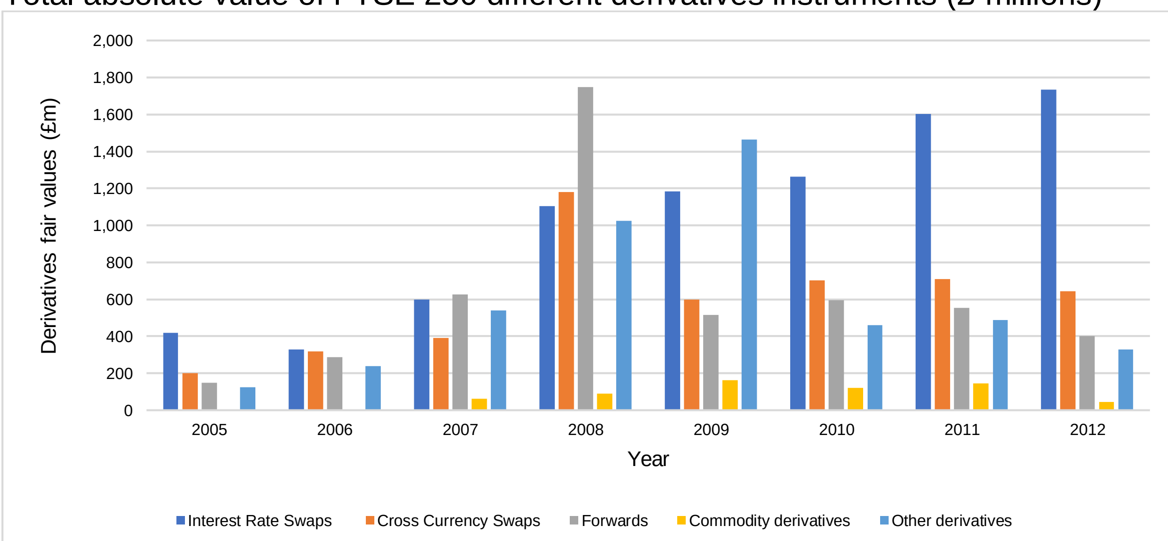


Figure 4.5
Total absolute value of FTSE 250 different derivatives instruments (£ millions)



In FTSE 250 firms, the absolute fair values of cross currency swaps have been gradually increased from 2005, reaching a value of £1.2b in 2008. That was followed by a dip in 2009 before again increasing thereafter. In FTSE 250 firms, there are was an increase in fair values in 2011 – common to all types of derivatives – followed by a decline in 2012. Furthermore, in medium sized firms, in 2009 just after the financial crisis, fair values of ‘other’ derivatives exceeded all other types of instrument.

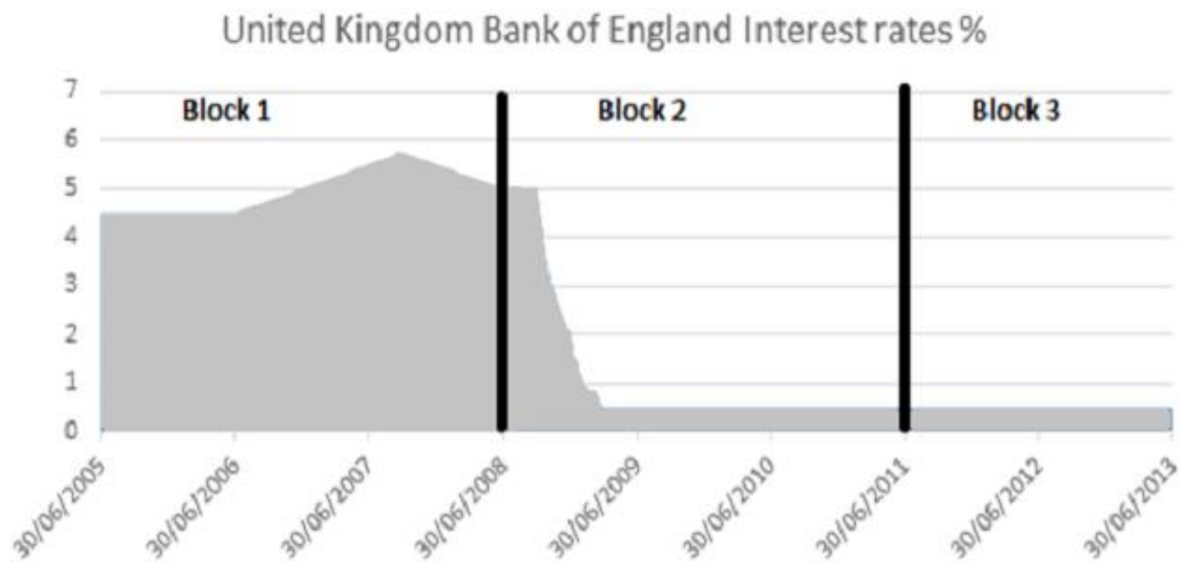
In FTSE 100 firms, the total absolute value of forwards contracts was £2.4b in 2005, and progressively increased by 619% to £14,8bn in the latter part of the financial crisis in 2008. However, since then the fair values of forwards have declined. By the end of 2012 it was only just over £4.4b.

In FTSE 100 firms, the trends of interest rate swap fair values show three distinct phases: phase 1 in year 2005-2007 (Block 1 in the graph below) where the total absolute fair values fluctuated between £2.8bn and £3.6b; phase 2 from year 2008 to 2010 (Block 2 in the graph below) with total fair values around £10bn; and phase 3 in 2011 and 2012 (Block 3 in the graph below) where fair values of the interest rate swaps has escalated by nearly 50%. In 2012, fair values of interest rate swaps were £16.7bn.

Though assessment of the current results with previous studies is important, the lack of availability of previous research on the usage of derivative fair values restricted the comparison of the above findings with existing data. In fact, several studies acknowledged this and identified it as an area for future research (Birt *et al*., 2013; Zhou and Wang, 2013). Therefore, the current results and findings can be identified as a reference point for future studies especially with regards to derivative fair value usage in UK non-financial firms. Another important point to note is that the increase in fair value measurement of derivatives under IFRS enhanced the consistency and quality of information concerning the use of derivatives for corporate risk management and decreased information asymmetry (Panaretou *et al*. 2013)

Figure 4.6 shows how Bank of England official interest rates changed during the study period. In 2005 to 2007 period (block 1) Bank of England official interest rates averaged around 5% and fluctuated between 4.5% and 5.75%. This relatively stable baseline interest rate created a low interest rate risk environment for non-financial firms, something reflected by the steady use of interest rate swaps. However, in mid-2008 Bank of England decreased its official interest rates to an all-time low of 0.5%, where it remained till the end of the study period. This sudden decrease in interest rates increased the interest rate risk profiles for larger firms, resulting in a huge escalation of fair value interest rate swaps worth £7.2bn, taking the total up to £10.8b by the end of financial year 2008. The remaining years in block 2 above showed the total fair value of interest rate swaps around £10bn. The constant 0.5% Bank of England base rate a major factor for this stability in outstanding interest rate swap fair values.

Figure 4.6
Bank of England Interest rate percentages



However, in 2011 - 2012 (block 3), the market reacted to this stable interest rate in a different manner as the total fair values of interest rate swaps began to upsurge. According to the UK government and outlook data, economic growth was heading towards the pre-crisis levels during phase 3. This uncertainty increased the interest rate risk, which is reflected in year-on-year rising fair values of interest rate swaps. Further, the effects of interest rate risk were comparatively more visible in FTSE 250 firms than the FTSE 100 firms, Figures 4.4 and 4.5 show how the interest rate swaps have changed with constant 0.5% Bank of England base rate during the latter half of the study period.

Figure 4.7
Total absolute value of FTSE 100 cross currency swaps (£ billions)

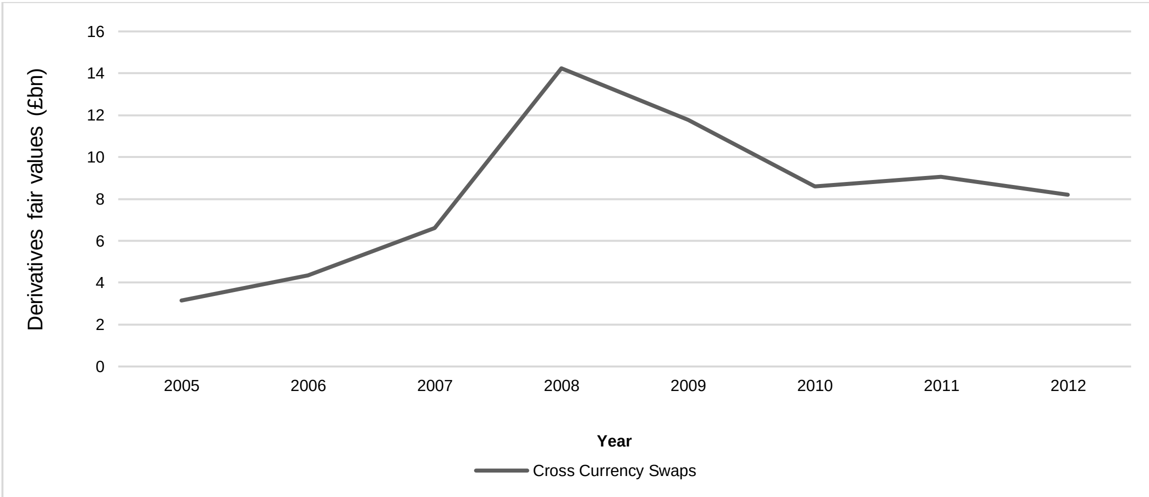
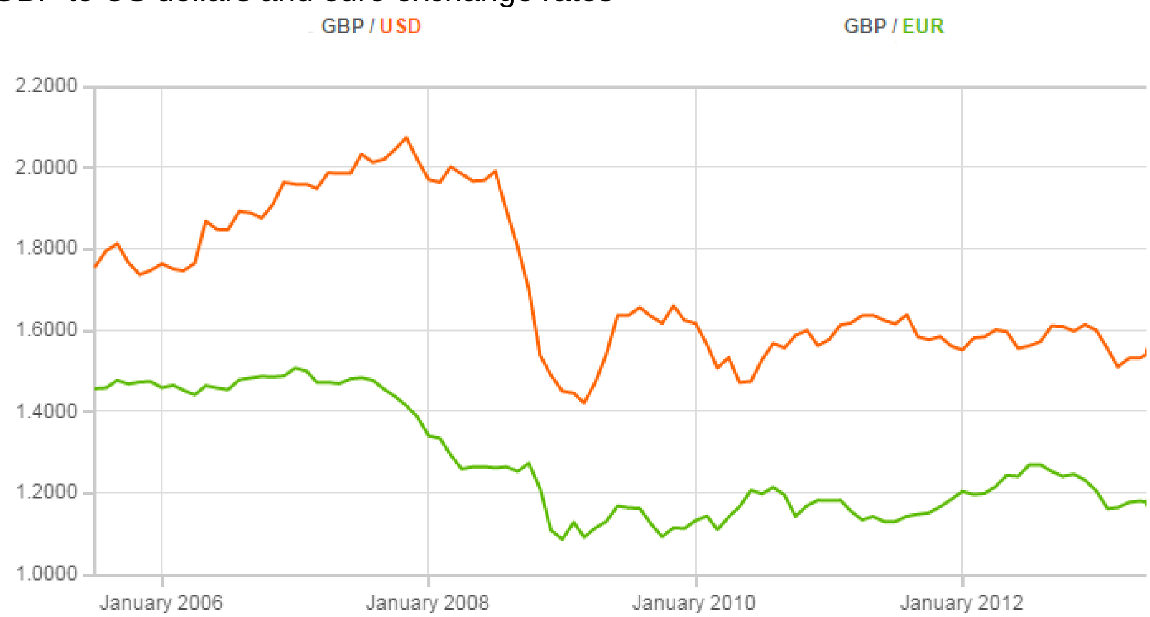


Figure 4.8
GBP to US dollars and euro exchange rates



Figures 4.7 and 4.8 show how the fair values of cross currency swaps and GBP/USD and GBP/EURO exchange rates varied significantly during the study period, respectively. They show that during the peak of the 2008 financial crises, sterling devalued against the US dollar and the Euro. The changes provide evidence of increased exchange rate risk, so influencing cross currency swap fair values. After the financial crisis, both the GBP/USD and GBP/EUR exchange rates were fairly

volatile. However, no significant changes similar to 2007-2008 were noted. This may at least partly explain the stable exchange rate risk and the stable cross currency swap fair values. The FTSE 250 cross currency swap fair values followed a similar pattern to FTSE 100 firms. Therefore, it is reasonable to assume that both large and mid-sized UK non-financial firms reacted to exchange rate risks in a similar manner.

Prior to the financial crisis, in FTSE 100 firms, ‘other derivative’ (i.e. Figure 4.4) fair values represented a significant proportion of total fair values. In fact, from 2005 to 2007, “other derivatives” fair values were the second-largest contributor to total fair values next to commodity derivatives. In 2008, forwards’ and cross currency swaps fair values slightly exceeded “other derivatives” and in 2009 cross currency swaps were marginally higher than “other derivatives” fair values. In 2010, as in 2005-2007, “other derivatives” fair values were the second largest behind commodity derivatives. In 2011 and 2012, total absolute fair value of commodity derivatives was the largest followed by interest rate swaps, other derivatives, cross currency swaps and forwards.

4.5.1 Different derivative instruments user statistics documented in other studies

This section examines the reported fair value of different derivatives instruments reported in previous studies and how those studies were conducted. The use of interest rate swaps were first reported in 1981 when IBM entered an interest rate swap contract with the World Bank (Allen, Kim and Zitzler, 2012). In the literature, there are two main reasons for using interest rate swaps: (i) to manage the interest rate risk arising from fixed or floating rate debts; and (ii) for speculative purposes (Balsam and Kim, 2001). Amongst US firms, Bodnar *et al*. (1995) reported a clear dominance of interest rate swaps as the vehicle for interest rate risk management with nearly 60% of the firms in their sample using interest rate swaps in 1994. In Berkman *et al.’s* 1997 study, the most frequently used instrument was interest rate swap, where they reported a figure close to 60%. Using annual report disclosures, Heaney and Winata (2005) reported that 59.3% of Australian firms used interest rate swaps to manage interest rate risk.

Table 4.7
Foreign currency forwards use in different countries (Source - Lel, 2012, page 224)

Country	**Number of observations**	**Foreign currency derivatives user percentage (%)**
Argentina	8	75.0
Australia	45	66.7
Chile	23	65.2
Colombia	6	0.00
Denmark	14	85.7
Finland	21	95.2
France	77	77.9
Germany	28	89.3
Greece	10	10.0
Hong Kong	15	0.00
Ireland	48	52.1
Israel	23	73.9
Italy	49	85.7
Japan	127	87.4
Mexico	42	33.3
Netherlands	75	76.0
Norway	17	82.4
Singapore	6	100.0
South Africa	5	20.0
South Korea	4	100.0
Sweden	44	75.0
Switzerland	18	77.8
United Kingdom	324	55.7

Several studies have examined the use of foreign currency forwards contracts. Grant and Marshall (1997) found that forwards use was widespread in UK firms, and their use is governed by company polices, commercial reasons and risk aversion. Bodnar *et al.* (1995) found that nearly 50% of the US firms used forward contracts, while Heaney and Winata (2005) reported that 74% of the largest 500 Australian publicly listed companies used foreign currency forward contracts. Further, Berkman *et al.* (1997) found that among New Zealand firms over 80% of firms used forward foreign exchange contracts. Clark and Salma Mefteh (2010) examined the foreign currency derivatives use in the largest French non-financial firms in 2004. They found that 103 of the 176 firms (58.5%) they studied used foreign currency derivatives.

Lel (2012) carried out a cross-country analysis of foreign currency derivatives use over the period 1990 to 1999. Their study involved countries representing every region in the world. Country level data from their study (Table 4.7) allow us to gain some insight into forward currency contracts usage throughout the world.

This study showed that weakly governed firms tend to use forwards for managerial reasons while more strongly governed firms used them to hedge currency exposure to overcome the market frictions accompanying costly external financing (Nance *et al.*, 1993; Gay and Nam, 1997; Géczy, Minton and Schrand, 1997). Additionally, their results showed that during the period 1990 to 1999 around 56% of UK non-financial firms used forward contracts. A comparison of their results to our findings suggests that the proportion of forwards users has increased in the last few decades. Table 4.8 summarises the derivatives instruments user statistics from previous studies.

Table 4.8
Worldwide derivatives instruments user statistics

Study	Year	Country	Interest rate derivatives %	Foreign currency derivatives %	Commodity derivatives %
Ivana *et al*. (2013)	2011	Croatia	N/A	22	N/A
Brunzell *et al*. (2011)	2007	Nordic firms	2007	81%	N/A
Nguyen & Faff (2002)	1999/2000	Australia	68.7%	83.6	35.6
Purnanandam (2008)	1996/1997	USA	N/A	27.9	17.0

4.6 Distribution of derivative users by hedging category

This section summarises derivatives usage by hedge accounting category. This summarises an important aspect of derivative usage as current hedge accounting practices consider not only whether or not there is a hedge, but also the type of hedge, which ultimately impact on income statements. Panaretou (2013) suggested that the introduction of IFRS may also have influence the hedging behaviour of firms. Furthermore they indicated that use of certain complex and not easily justifiable derivatives is likely to be reduced; and also firms with limited treasury resources may abandon their hedging activities Hence these numerical disclosures can enhance the understanding of fair value accounting on derivatives use.

4.6.1 Use of hedge accounting

Figure 4.9 shows the proportions of FTSE 350,100 and 250 firms using hedge accounting during the study period.

Figure 4.9
Comparison of FTSE 350, FTSE 100 and FTSE 250 hedge accounting user proportions amongst derivatives users

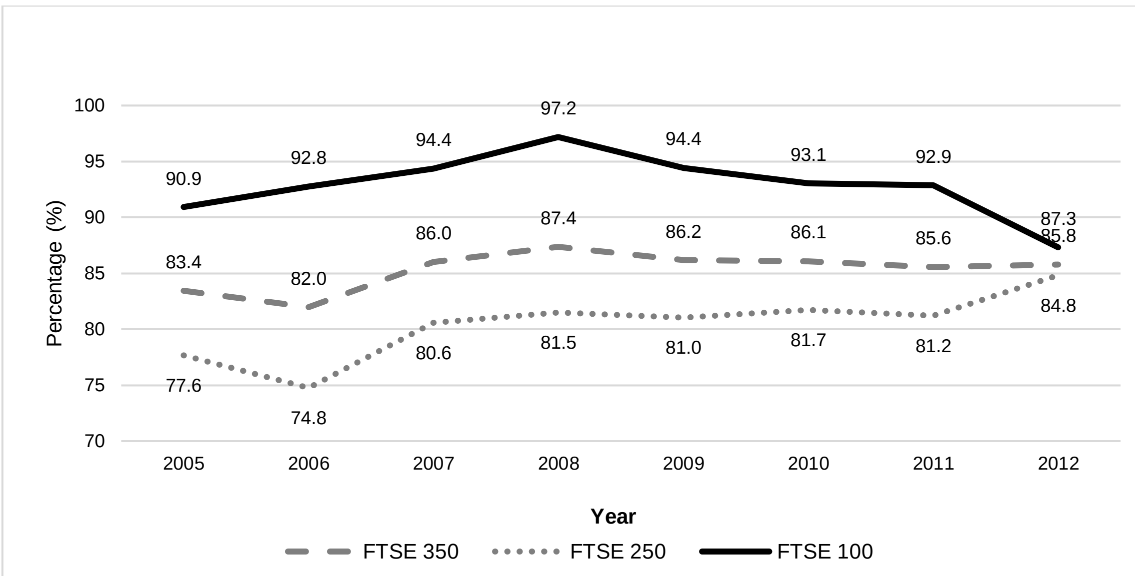


Table 4.9
No. of FTSE 100 and FTSE 250 hedge accounting users among derivatives user non-financial firms

Year	2005	2006	2007	2008	2009	2010	2011	2012
No. of FTSE 100 Derivatives users	68	72	74	74	75	75	73	74
No. of FTSE 100 Hedge accounting users	60	64	67	69	68	67	65	62
No. of FTSE 250 Derivatives users	87	105	110	121	118	117	119	114
No. of FTSE 250 Hedge accounting users	66	77	87	97	94	94	95	95

Throughout the study period, the use of hedge accounting for the purposes of derivatives accounting increased among FTSE 350 non-financials (Table 4.9 and Figure 4.9). The lowest proportion (82%) of hedge accounting users among FTSE 350 non-financial derivatives users were in 2006, while 2008 had the highest (87.4%) proportion. Further, it is evident that FTSE 100 firms are the more prominent hedge accounting users: in FTSE 100 firms the lowest and highest proportions were 87.3% (in 2012) and 97.2% (in 2008) respectively. In FTSE 250 firms the corresponding lowest and highest figures were 74.8% (in 2006) and 84.8% (in 2012), respectively. Figure 4.9 also shows that from 2005 to 2008, the percentage of FTSE 100 hedge accounting users gradually increased. However, from then to 2012 there was a 10% drop in FTSE 100 hedge accounting users; half of this drop was in 2012. In contrast, FTSE 100 derivatives users did not decrease between 2011and 2012. Among FTSE 250 firms the percentage of hedge accounting users increased up until 2008 and since then fluctuated around 81%. However, unlike among FTSE 100 firms, in 2012 there was an increase in FTSE 250 hedge accounting users from 81.2% to 84.8%. This demonstrates that larger firms with resources and specialised knowledge were more concerned about using hedge accounting during the financial crisis, whereas the increasing use of hedge accounting in medium firms was driven by other factors; possibly increased knowledge about derivatives and hedge accounting (Comiskey and Mulford, 2009). Regardless, from 2005 to 2012, the average FTSE 100 hedge accounting user percentage was 92.9% while in FTSE 250 firms it was 80.4%. This shows that larger firms are more likely to use hedge accounting, which supports previous studies. Further proportion of hedge accounting users amongst derivatives user FTSE100 and FTSE250 firms converged from 2011 to 2012.

There are only a limited number of previous studies that disaggregated derivatives usage data based on hedging categories. Selvi and Türel (2010) examined the derivatives accounting data in a Turkish context and reported that 39% of their derivatives users applied hedge accounting, which is permitted by IAS 39. Glaum & Klöcker (2011) surveyed German and Swiss non-financial firms (all of which apply IFRS) in the winter of 2007–2008, and analysed the application of hedge accounting and its influence on hedging behaviour. They found that 72% of firms included in their sample applied hedge accounting. Their evidence suggests that larger firms and the firms that use derivatives for hedging purposes are more likely to apply hedge accounting. Furthermore, they found that hedge accounting use is positively related to firms' exposure to IFRS accounting experience suggesting that if a firm have been using IFRS for longer, they are more likely to engage in hedge accounting. Their rationale behind this was the length of voluntarily disclosure prior to mandatory adaption of IFRS for financial instruments; that some firms may have adopted a step-by-step approach, once gaining experience and setting up advanced information systems. Additionally, their results indicated that growing companies are less likely to apply hedge accounting compared to companies in more mature markets.

4.6.2 Total absolute fair value of derivatives accounted under hedge accounting

Table 4.10 shows the reported fair values of derivatives accounted under hedge accounting. The previous section showed that an increasing proportion of FTSE 250 firms used hedge accounting. However, only a small proportion of fair values was in fact accounted for under hedge accounting rules. In 2005, the proportion was only 11.8%. Nevertheless, throughout the study period the proportion of fair values accounted for under hedge accounting increased.

Table 4.10
FTSE 350, FTSE 100 and FTSE 250 non-financial firms: hedge accounted fair values and their proportions

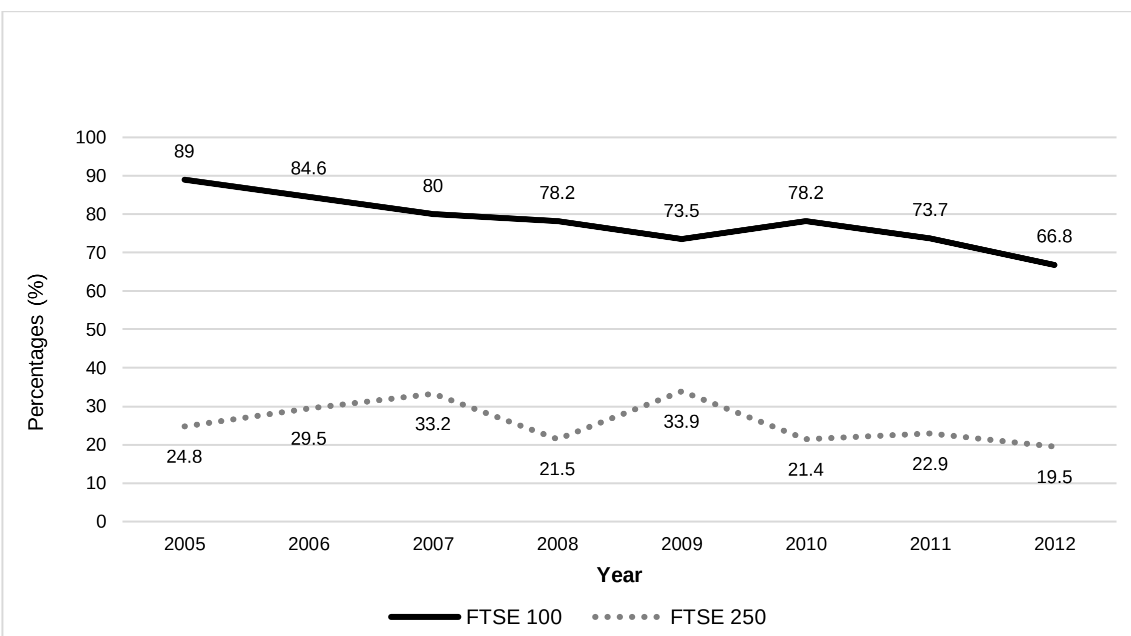
	FTSE 350			FTSE 100			FTSE 250		
Year	No of hedge accounting users	Total hedge accounted fair values (£m)	Proportion of hedge accounted fair values (%)	No of hedge accounting users	Total hedge accounted fair values (£m)	Proportion of hedge accounted fair values (%)	No of hedge accounting users	Total hedge accounted fair values (£m)	Proportion of hedge accounted fair values (%)
2005	126	8,089.1	11.8	60	7,413.2	11.0	66	675.9	75.2
2006	141	8,488.9	16.7	64	7,661.6	15.4	77	827.3	70.5
2007	154	12,287.7	21.9	67	10,805.8	20.0	87	1,481.9	66.8
2008	166	31,399.2	24.0	69	27,362.6	21.8	97	4,036.6	78.5
2009	162	21,210.2	28.6	68	18,616.7	26.5	94	2,593.6	66.1
2010	161	17,984.5	24.2	67	15,514.6	21.8	94	2,469.9	78.6
2011	160	20,285.3	28.8	65	17,588.4	26.3	95	2,696.9	77.1
2012	157	20,869.8	35.7	62	18,331.8	33.2	95	2,537.9	80.5

By the end of 2012 financial year, this figure had tripled to around 35.7%. Similarly, in 2005 amongst FTSE 100 firms, only £7.4b was reported under hedge accounting; by the end of study period this amount had gradually increased to £18.3b. Compared to FTSE 100 firms, a much smaller percentage of FTSE 250 firms used hedge accounting; yet their fair values showed a much higher percentage compared to reported total FTSE 250 fair values of derivatives. In 2005, the percentage of FTSE 250 firms using hedge accounting was 75.2%, although this figure came down to 66.1% in 2009, before increasing again to 80.5% by the end of 2012.

4.6.3 Comparison of FTSE 100 and FTSE 250 non-hedge accounted fair value Proportions

Figure 4.10 shows how FTSE 100 and 250 non-hedge accounted fair value percentages behaved during the study period. In 2005 75.2% of FTSE 250 derivative fair values were accounted as hedged, while the bulk of the FTSE 100 fair values were treated as non-hedged derivatives. In both FTSE 100 and FTSE 250, show a downward slope, indicating that FTSE firms were using more and more hedged derivative fair values in their balance sheets irrespective of the size of the firm.

Figure 4.10
Comparison of FTSE 100 and FTSE 250 non-hedge accounted fair value proportions

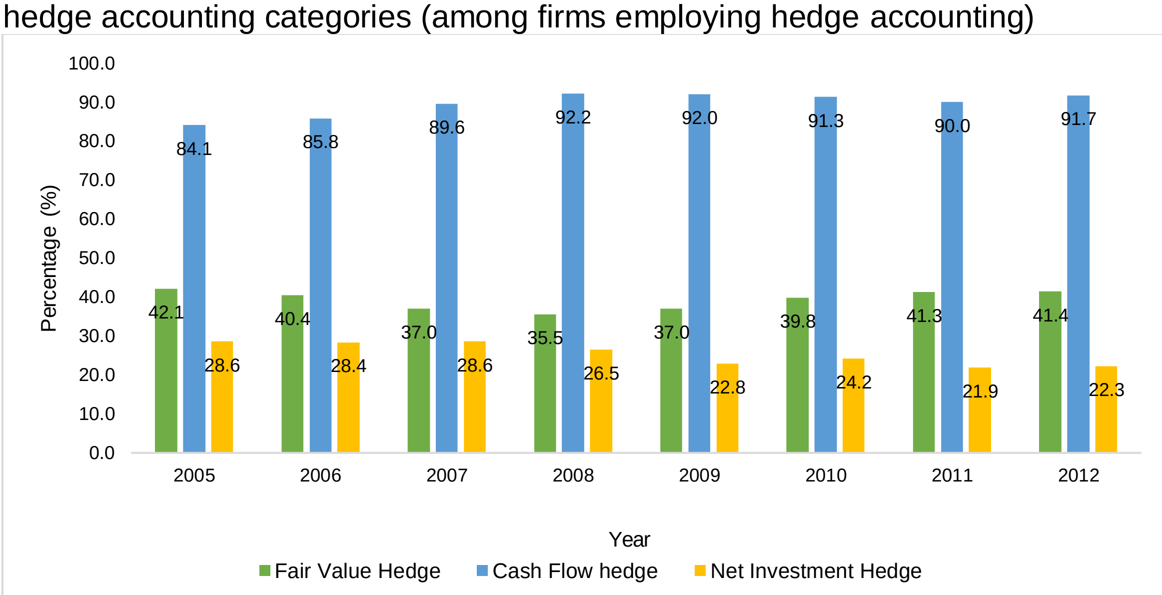


4.6.4 Derivatives use based on the hedging category.

The majority of previous empirical studies that examined the use of derivatives used binary variables, notional values or surveys to obtain their results (Bodnar *et al*., 1998; Graham and Rogers, 2002; Judge, 2006). Due to inconsistencies in reporting and data collection difficulties, disaggregating derivatives use data by hedging categories was nearly impossible. Haushalter (2000) suggested that the use of non-continuous data only partially measured the extent of hedging, hence possibly leading to biased outcomes. Nevertheless, as explained in Chapter 1, even though identification and collection of disaggregated derivatives fair values are time-consuming and cumbersome processes, access to largely consistent and comparable data is now possible. By using the fair value approach, this study has addressed data issues, which were problems in earlier studies.

The following sections examine to what extent the different hedging categories were used, and what instruments were used in each hedging category. Figure 4.11 shows the proportion of FTSE 350 firms using different hedging categories between 2005 and 2012.

Figure 4.11
FTSE 350 derivative-user, non-financial firms: proportion of firms using different hedge accounting categories (among firms employing hedge accounting)



Cash flow hedges were the most widely used hedging category among FTSE 350 firms, with the proportion of cash flow hedge users increasing from 84.1% in 2005 to 92.2% in the 2007/2008 financial crisis. It then remained above 90% throughout the rest of the study period. On the other hand, fair values hedge use gradually declined from 42.1% in 2005 to 35.5% in 2008. After that user percentages increased, reaching 41.4% by the end of 2012 financial year.

Compared to cash flow hedges, there were smaller number of fair value hedges and net investment hedge users. From 2005 to 2007, net investment hedge user percentages fluctuated between 28.4% and 28.6%. Since 2008 (26.5%) it has declined, averaging around 22.8% in the following years. Even though comparing current results with those in pre-existing literature, there is little availability of existing literature. However, recent studies by Campbell (2015) and Campbell *et al.* (2015) focused their attention on cash flow hedge fair values and how they behave in different environments. These studies, coupled with current study, will provide a direction and guideline to future studies, highlighting the knowledge gaps, and existing sources of the derivatives-related data. Furthermore, in Chapter 5 and Chapter 6 the current study will undertake further investigation of the determinants of usage and value relevance of these hedging categories.

Table 4.11
FTSE 350 FVTPL user proportions[30]

Year	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Derivatives Users	151	172	179	190	188	187	187	183
No of FVTPL users	97	110	112	125	124	121	116	116
FVTPL percentage (%)	64.2	64.0	62.6	65.8	66.0	64.7	62.0	63.4

Table 4.11 shows the number of FTSE 350 firms holding derivatives positions as fair value through profit and loss and their respective percentages with respect to total derivative users. Under IFRS, derivatives fair values not recognised as hedge accounting are reported as fair value through profit and loss. The proportion of firms

30 Please note as five firms could not disaggregate accurately in to hedging categories these were dropped from the analysis.

accounting for derivatives as fair value through profit or loss has remained relatively constant throughout the study period. There could be several possible explanations for this behaviour:

(i) If a firm used FVTPL to account for a particular derivative for a year, throughout the life of that derivative the firm must use FVTPL as the hedge accounting rules clearly says that at the beginning of the hedging transaction firm must decide which hedging category it intends to use. Therefore hedging versus FVTPL choices tend to perpetuate. Further firms might change their hedge accounting choice when they acquire new derivative positions. However data shows that they tend not change much. One possible reason is application of the consistency principle of accounting.

(ii) Existence of ineffective hedges.

4.6.4.1 Comparison of FTSE 100 and 250 user proportions under different hedging categories.

Table 4.12
FTSE 100 and FTSE 250 derivative-user, non-financial firms: proportion of firms using different hedge accounting categories (among firms employing hedge accounting)

Year	FTSE 100			FTSE 250		
	Fair Value hedge user proportions (%)	Cash flow hedge user proportions (%)	Net investment hedge user proportions (%)	Fair Value hedge user proportions (%)	Cash flow hedge user proportions (%)	Net investment hedge user proportions (%)
2005	61.7	87.9	36.7	24.2	80.0	21.2
2006	59.4	92.2	34.4	24.7	78.1	23.4
2007	55.2	94.3	32.8	23.0	83.6	25.3
2008	59.4	97.9	31.9	18.6	84.1	22.7
2009	58.8	97.9	29.4	21.3	83.8	18.1
2010	61.2	98.9	31.3	24.5	80.6	19.1
2011	64.6	97.9	29.2	25.3	78.5	16.8
2012	67.7	97.9	32.3	24.2	82.3	15.8

Table 4.12 show that in both FTSE 100 and 250 firms, cash flow hedges were the most widely used. In 2005 87.9% of FTSE 100 hedge accounting user firms showed cash flow hedging fair values in their balance sheets. This figure increased up to 97.9% by 2011/2012. In the case of FTSE 250 firms, the cash flow hedge user percentage varied from 78.1% to 84.1% during the study period.

The fluctuations in proportion of fair value hedge users were different to that of cash flow hedge users. 2007 showed the lowest figure for FTSE 100 fair value hedge proportions (55.2%) while highest was in 2012 (67.7%). In FTSE 250 firms, the lowest and highest were 18.6% in 2008 and 25.3% in 2011, respectively. The main difference between the cash flow and the fair value hedge users was that during the financial crisis in both FTSE 100 and FTSE 250 firms cash flow hedge user percentages peaked whereas fair value hedge user percentages were at their lowest figure.

On average, the least used hedging category is net investment hedges. In FTSE 100 firms, 2005 marked the highest proportion of net investment hedges users (36.7%) while the lowest was in 2011 (29.2%). However, in medium-sized firms, net investment hedge users proportions showed an upward trend until the end of 2007. The strengthening of the pound against the US dollar could have been an influential factor in this increase as it increased exchange rate risk. Nonetheless, in large and medium sized firms, net investment hedges user percentages showed a declining trend during the study period. Accounting treatment for net investment hedges permits deferring gains or losses until the underlying transaction is complete, as long as the hedge is effective. Furthermore, the majority of the occasions net investment hedges were used was to hedge a net investment in a foreign entity. Therefore, this declining trend suggests a few scenarios: (i) firms' net investment in a foreign operation is on a downward trend and as a result future expected gains or losses from these operations will also decrease; (ii) firms' focus moves away from managing the risk related to foreign operations; or (iii) perhaps even risks have decreased due to various economic factors.

4.6.5 Total absolute fair values under different hedging categories.

4.6.5.1 FTSE 350 hedging category fair values

Table 4.13 shows that total fair values of fair values and cash flow hedges continued to increase until 2008 and then declined in the following two years. However, in 2011 this downward trend reversed and total fair values started to increase again until the end of the study period. In the case of net investment hedges, total fair values showed a similar pattern until the end of the financial crisis; although afterwards these decreased noticeably. In terms of fair values of the hedged derivatives, until 2009 cash flow hedges were the most widely used followed by fair values hedges and net investment hedges. From 2010, fair value hedges overtook cash flow hedges.

Table 4.13
FTSE 350 Total absolute fair values under different hedging categories

Year	Fair value hedge			Cash flow hedge			Net investment hedge		
	No of firms	Sum (£m)	Mean (£m)	No of firms	Sum (£m)	Mean (£m)	No of firms	Sum (£m)	Mean (£m)
2005	53	2,826.4	53.3	106	4,047.9	38.2	36	1214.7	33.7
2006	57	2,817.3	49.4	121	4,049.3	33.5	40	1622.3	40.6
2007	57	3,929.8	68.9	138	6,024.0	43.7	44	2333.9	53.0
2008	59	11,861.3	201.0	153	15,202.3	99.4	44	4335.6	98.5
2009	60	9,196.6	153.3	149	9,601.1	64.4	37	2412.6	65.2
2010	64	8,711.9	136.1	147	7,363.0	50.1	39	1909.6	49.0
2011	66	11,411.1	172.9	144	7,637.8	53.0	35	1236.4	35.3
2012	65	11,444.1	176.1	144	8,324.0	57.8	35	1101.7	31.5

4.6.5.2 FTSE 100 and FTSE 250 hedging category fair values comparison

Table 4.14 summarises the distribution of absolute fair values across the three hedging categories between 2005 and 2012 in FTSE 100 and FTSE 250 firms. It shows that in FTSE 100 firms net investment hedges were the least used during the period covered by the study. In FTSE 250 firms, net investment hedge fair values were the least used in year 2005-2006 and again in 2012. However, during the financial crisis, as well as just before and after, the proportion of fair value hedge users was the highest, followed by net investment hedge users.

Throughout the study period cash flow hedge fair values were the most used by FTSE 250 firms. Further, during the study period fair value hedges showed the greatest variability. In FTSE 100 firms, the least variability in fair value hedge usage was in 2006, ranging from £2.4m to £324.4m; the most variability was in 2008 where the minimum and the maximum was £1.2m and £2.6b. Cash flow hedge usage ranged from £854m in 2005 to just over £3b in 2008; net investment hedges usage varied from £ 266m in 2005 to £1.15b in 2008.

Table 4.14

FTSE 100 and FTSE 250 fair values comparison based on hedging categories

	FTSE 100					FTSE 250				
Year	**N**	**Sum (£m)**	**Mean (£m)**	**Min (£m)**	**Max (£m)**	**N**	**Sum (£m)**	**Mean (£m)**	**Min (£m)**	**Max (£m)**
Fair Value Hedge										
2005	37	2,702.2	73.0	0.40	408.0	16	124.2	7.76	0.20	47.5
2006	38	2,697.3	71.0	2.40	324.4	19	120.0	6.32	0.20	30.9
2007	37	3,755.6	101.5	2.80	806.0	20	174.2	8.71	0.10	51.8
2008	41	11,408.5	278.3	1.20	2,604.0	18	452.9	25.2	1.10	155.6
2009	40	8,926.6	223.2	6.00	1,333.3	20	270.0	13.5	0.40	84.7
2010	41	8,362.1	204.0	0.80	924.9	23	349.8	15.2	0.10	108.9
2011	42	10,967.2	261.1	6.40	1,338.4	24	443.9	18.5	0.40	125.1
2012	42	10,974.2	261.3	8.40	1,424.2	23	469.9	20.4	0.30	111.8
Cash Flow Hedge										
2005	48	3,607.3	75.2	0.10	854.0	58	440.6	7.60	0.00	109.0
2006	50	3,459.2	69.2	0.40	1,033.0	71	590.1	8.31	0.01	101.5
2007	56	4,977.7	88.9	0.03	1,174.0	82	1,046.3	12.8	0.05	227.8
2008	58	12,319.3	212.4	0.63	3,016.0	95	2,882.9	30.3	0.06	551.2
2009	57	7,656.4	134.3	0.30	1,989.0	92	1,944.7	21.1	0.10	407.8
2010	54	5,620.8	104.1	1.00	925.0	93	1,742.2	18.7	0.10	207.0
2011	51	5,665.3	111.1	0.30	1,287.0	93	1,972.4	21.2	0.07	297.0
2012	51	6,437.6	126.2	0.20	1,477.0	93	1,886.4	20.3	0.00	329.0
Net Investment Hedge										
2005	22	1,103.6	50.2	0.80	266.0	14	111.1	7.94	0.07	24.7
2006	22	1,505.1	68.4	0.50	341.0	18	117.2	6.51	0.30	27.8
2007	22	2,072.6	94.2	1.00	431.0	22	261.4	11.9	0.10	104.9
2008	22	3,634.8	165.2	1.00	1,150.0	22	700.8	31.9	0.10	128.1
2009	20	2,033.7	101.7	2.00	842.0	17	378.9	22.3	0.16	111.7
2010	21	1,531.7	72.9	1.70	538.0	18	377.9	21.0	0.10	78.9
2011	19	955.8	50.3	0.30	413.0	16	280.6	17.5	0.45	62.6
2012	20	920.1	46.0	0.80	393.0	15	181.6	12.1	0.40	66.4

4.6.6 The use of different derivatives instruments by hedging category

The remainder of this chapter further disaggregate reported derivative values based on their hedging category. This is important, because previous studies have looked at derivative values at aggregate levels due to lack of disclosure and have highlighted the importance of detailed disaggregation of derivative values to gain better understanding of how these are used by firms. This study shows that the extent and nature of derivatives usage can be disaggregated, and analysed at a level previously not thought possible. First, this study examines how the different derivatives instruments were distributed under fair values hedges followed by an evaluation of their respective fair value positions. It then expands to cash flow hedge and net investment hedge derivatives positions.

4.6.6.1 The proportions of derivative instruments in fair value hedges

Figure 4.12 and figure 4.13 show that in FTSE 100 and FTSE 250 firms interest rate swaps were the derivative instrument type for which the greatest proportion was accounted for as fair value hedges. In 2005, among FTSE 100 firms using interest rate swaps, 86.5% used fair value hedges while 81.3% in FTSE 250. By the end of 2008 only 44.4% of medium-sized interest rate swaps users used fair value hedge while in larger firms this percentage had risen to 90.2%. Cross currency swaps and forwards are the other main instruments accounted for as fair value hedges. In FTSE 100 firms, the use of cross currency swaps varied between 43.2% and 31% showing a declining trend during the study period, while in FTSE 250 firms this fluctuated between 25% and 39.1% showing an upward trend.

In addition, none of the FTSE 250 firms used fair value hedges for accounting purposes in the ‘other derivatives’ category. Similarly, in FTSE 100 firms, in 2007 and from 2009 onwards none of the derivatives in ‘other derivatives’ category was accounted under fair value hedges.

Figure 4.12
Distribution of different instruments – FTSE 100 fair value hedges.

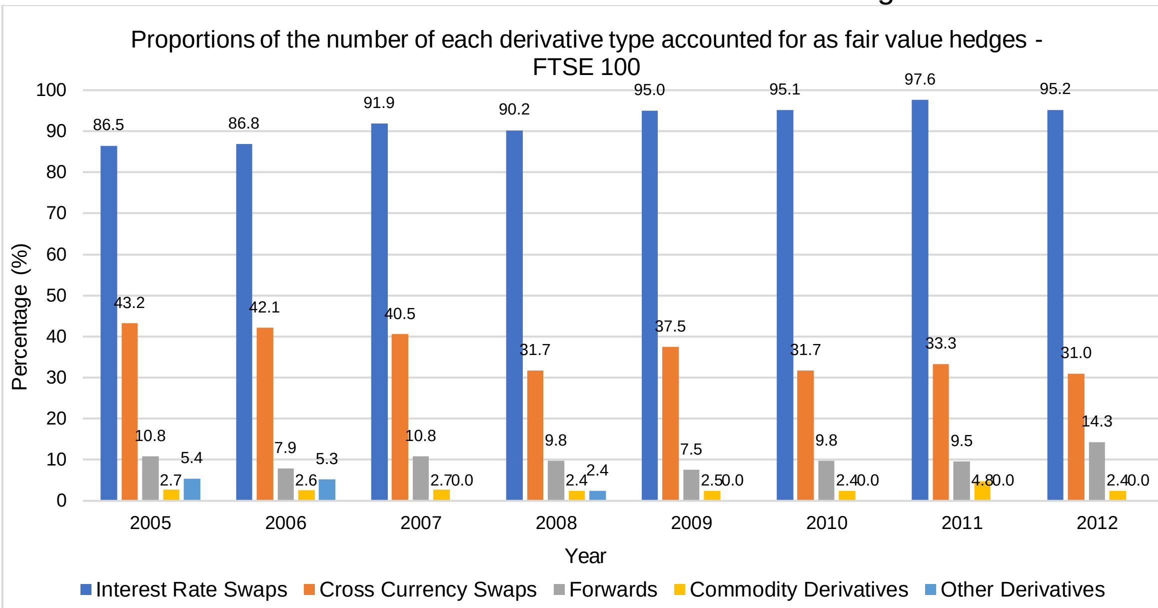
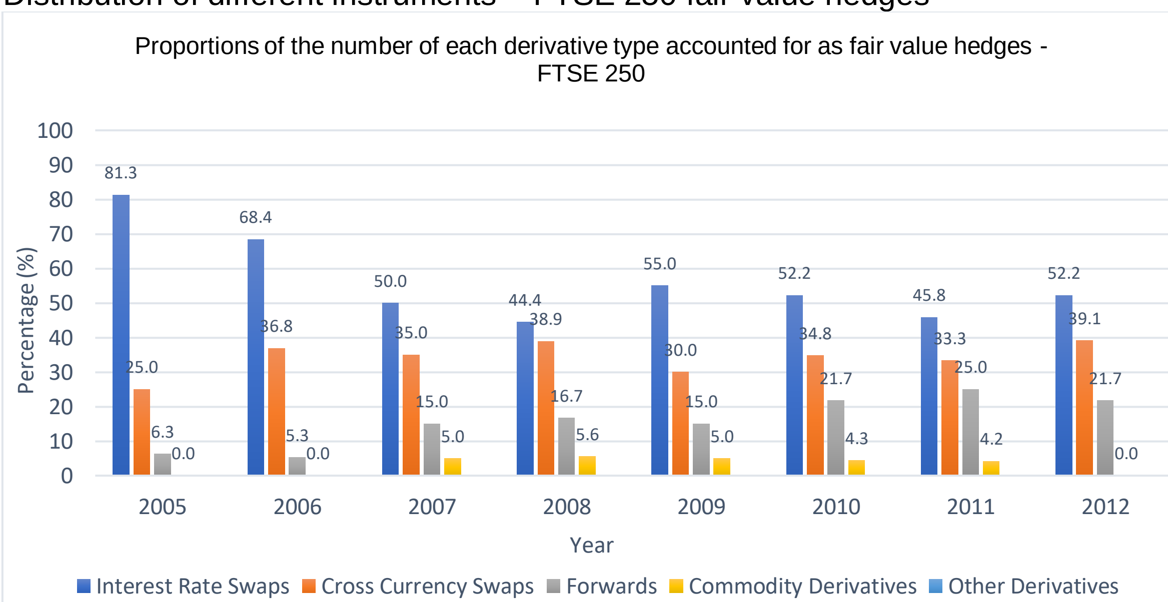


Figure 4.13
Distribution of different instruments – FTSE 250 fair value hedges



As explained earlier, disaggregation of derivatives to this study's level is very rare in the literature. However, Nguyen *et al.* (2007) examined the derivatives use among US firms and found that 22% of their sample firms used interest rate derivatives as fair value hedges in 2000, rising in 2001 to 32%; foreign currency contracts use as fair value hedges was 7% in 2000 and 8% in 2001. In addition, their results show that 2% and 4% of firms assigned commodity derivatives as fair value hedges in the years 2000 and 2001 respectively. Even though their statistics are somewhat different to this study results, it shows that interest rate swaps are the most frequently assigned derivatives as fair value hedges while from time to time forwards and rarely commodity derivatives also reported as fair value hedges.

4.6.6.2 Comparison of fair value hedge absolute gross fair values of different derivative instruments

Table 4.15
Distribution of fair value hedge fair values - FTSE 100 and FTSE 250 derivative instruments.

Year	FTSE 100					FTSE 250				
	Interest rate swap (£m)	Cross currency swap (£m)	Forwards (£m)	Commodity derivatives (£m)	Other derivatives (£m)	Interest rate swap (£m)	Cross currency swap (£m)	Forwards (£m)	Commodity derivatives (£m)	Other derivatives (£m)
2005	1,466.9	1,127.5	85.4	8.1	14.4	120.6	3.4	0.2	0.0	0.0
2006	1,556.4	1,124.1	3.6	2.1	11.2	70.9	48.9	0.3	0.0	0.0
2007	1,904.9	1,810.0	40.2	0.4	0.0	54.6	63.7	4.2	51.8	0.0
2008	6,706.2	4,628.6	72.1	0.1	1.4	127.8	268.6	39.3	17.2	0.0
2009	4,332.4	4,562.9	30.7	0.5	0.0	121.6	137.1	8.8	2.5	0.0
2010	4,663.5	3,483.5	213.0	2.2	0.0	123.5	197.7	23.5	5.0	0.0
2011	7,048.5	3,846.8	70.0	3.2	0.0	214.3	213.0	14.0	2.6	0.0
2012	7,471.7	3,462.0	39.9	0.5	0.0	267.7	194.4	7.9	0.0	0.0

Table 4.15 shows the distribution of absolute values of fair values in FTSE 100 and FTSE 250 firms by instrument type. It shows that of the value of derivatives accounted for as fair value hedges, the majority by far relates to interest rate swaps and cross currency swaps in FTSE 100 and 250 firms with relatively smaller amounts of forwards contracts.

4.6.6.3 The proportions of derivative instruments in cash flow hedges

Figure 4.14 and 4.15 show the proportions of different derivative instrument types which are accounted for as cash flow hedges by larger and mediums-sized FTSE firms. In larger FTSE firms, foreign currency forwards contracts reported as cash flow hedges showed the highest percentage. In FTSE 250 firms, however, during 2005-2006 a higher proportion of interest rate swap contracts were accounted for as CF hedges, as compared the to the percentage for other instrument types. Afterwards with the exception of 2009 this changed to forward currency contracts, while in 2009 both interest rate swaps and forwards contracts were used in equal measure, 54.3%.

Figure 4.14

Distribution of different instrument proportions – FTSE 100 cash flow hedges

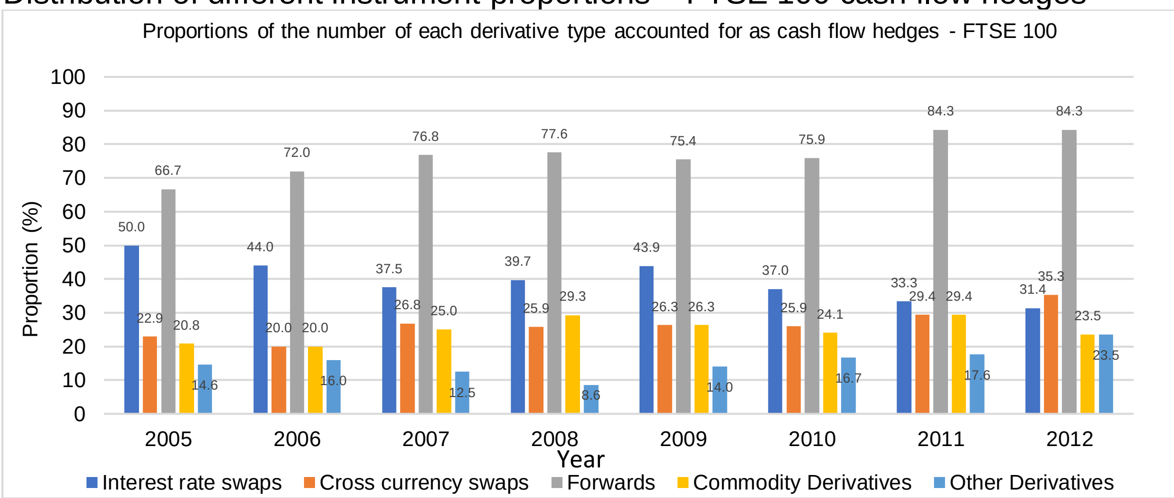
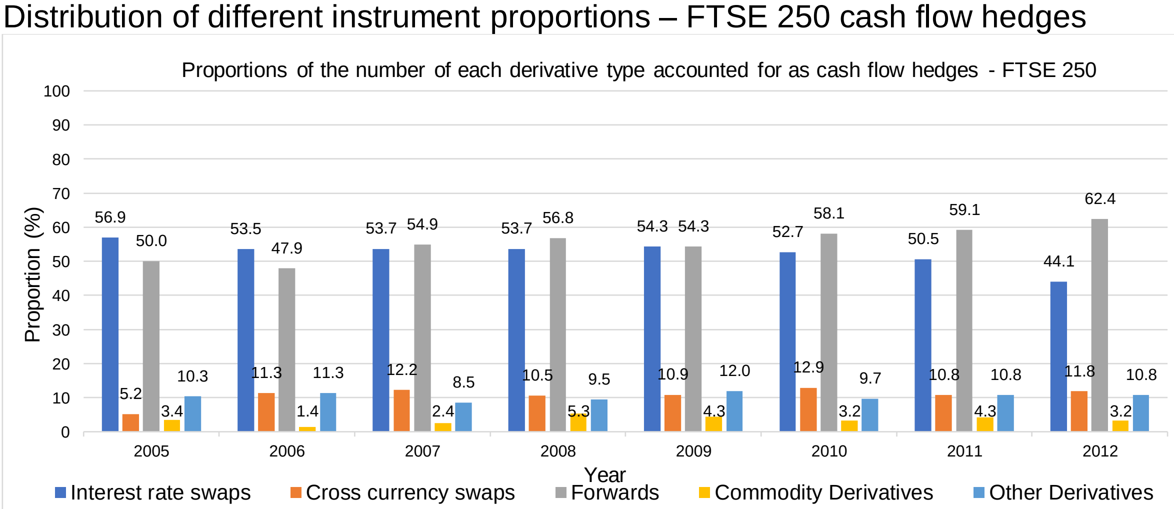


Figure 4.15

Distribution of different instrument proportions – FTSE 250 cash flow hedges



During the study period, in FTSE 100 firms the derivative type for which the lowest proportion of contracts were ‘other derivatives’. In FTSE 250 firms commodity derivatives was the derivative type for the which the lowest proportion of contracts were accounted for as cash flow hedges. This varied from 1.4% in 2006 to 5.3% in 2008.

The study by Nguyen *et al.* (2007) of US derivatives use shows that the proportion of foreign currency derivatives accounted for as cash flow hedges was as high as 52% in year 2000 and 55% in 2001. In the case of interest rate derivatives 36% and 40% of firms used cash flow hedges in 2000 and 2001 respectively. Furthermore, their results show that 22% and 26% of the US firms reported commodity derivatives as cash flow hedges in year 2000 and 2001 respectively.

4.6.6.4 Distribution of cash flow hedge fair values amongst derivative instruments - FTSE 100 and FTSE 250.

Figure 4.16 and 4.17 show how fair values of different derivative instruments were distributed among FTSE 100 and FTSE 250 cash flow hedges.

Figure 4.16
Distribution of cash flow hedge fair values proportions amongst derivative instruments - FTSE 100.

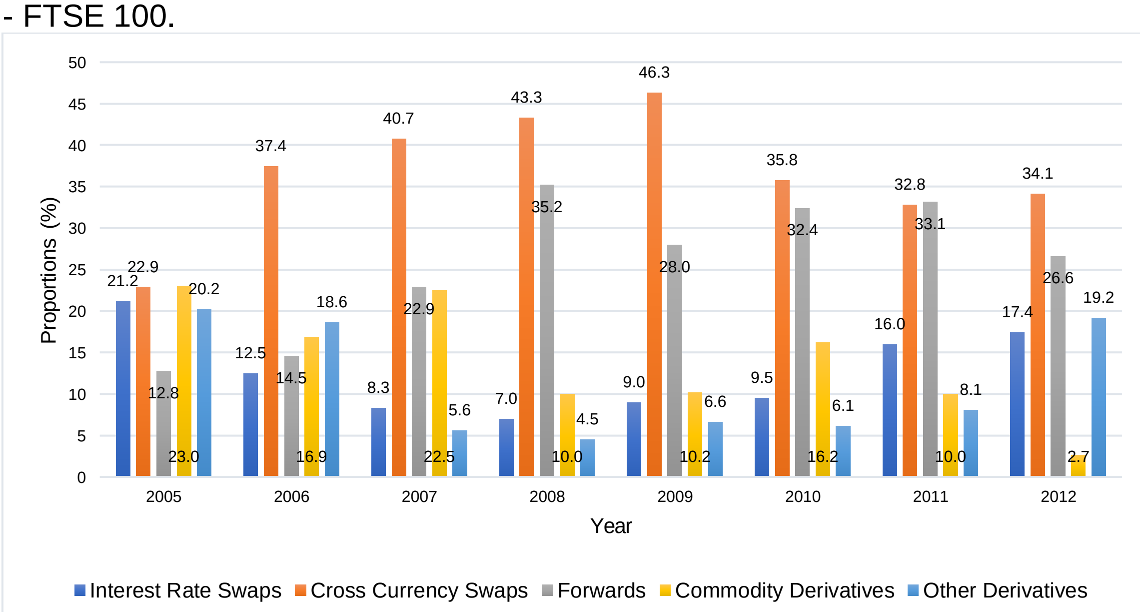
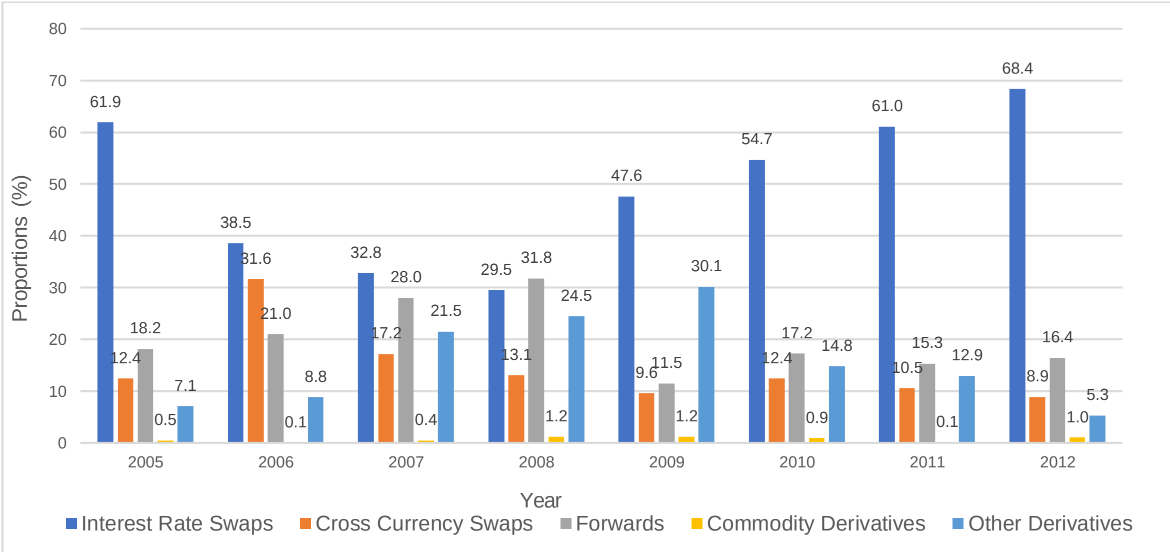


Figure 4.17
Distribution of cash flow hedge fair value proportions amongst derivative instruments - FTSE 250.
.



Even though forwards appeared to be the most frequently accounted derivatives instrument as cash flow hedges amongst FTSE 100 firms (see figure 4.14), cross currency swaps total fair values exceeded forwards currency contract fair values in most of the study years. In FTSE 250 firms, except for 2008, interest rate swaps fair values had the highest proportion of cash flow hedge fair values. In 2005, 61.9% of disclosed FTSE 250 cash flow hedge fair values were interest rate swaps, although this figure declined rapidly to 29.5% in 2008. This trend then, reversed and by the end of 2012 it was as high as 68.4%

4.6.6.5 Derivative instruments distribution under net investment hedges

Table 4.14 shows that neither FTSE 100 nor FTSE 250 firms used net investment hedges to for accounting commodity derivatives. Further, during the study period none of the FTSE 100 firms accounted for their Interest rate swaps as net investment hedges. Several FTSE 250 firms, however, accounted for their interest rate swaps as net investment hedges in their balance sheets. Until 2007 cross currency swaps were the most commonly used derivative instrument in net Investment hedges category in both large and medium-sized FTSE firms. However, this changed to forward contracts from 2008 and after that there was no clear leader as regards derivative instrument type accounted for as net investment hedge. However, among FTSE 100 firms there was an upward trend of forwards being accounted for as net investment hedges.

Table 4.16
Net investment hedge user proportions – FTSE 350, FTSE 100 and FTSE 250 derivative instruments.

Year	2005	2006	2007	2008	2009	2010	2011	2012
Interest rate swaps user proportions (%)								
FTSE 350	2.80	5.00	9.10	2.30	2.70	0.00	2.90	0.00
FTSE 100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FTSE 250	7.10	11.1	18.2	4.50	5.90	0.00	6.30	0.00
Cross currency swaps user proportions (%)								
FTSE 350 CCS users (%)	58.3	60.0	56.8	45.5	51.4	51.3	54.3	60.0
FTSE 100 CCS users (%)	59.1	63.6	63.6	54.5	60.0	52.4	57.9	60.0
FTSE 250 CCS users (%)	57.1	55.6	50.0	36.4	41.2	50.0	50.0	60.0
Foreign currency forwards user proportions (%)								
FTSE 350 FWD users (%)	44.4	40.0	47.7	59.1	51.4	56.4	57.1	48.6
FTSE 100 FWD users (%)	45.5	50.0	54.5	59.1	55.0	61.9	63.2	60.0
FTSE 250 FWD users (%)	42.9	27.8	40.9	59.1	47.1	50.0	50.0	33.3
Commodity derivatives user proportions (%)								
FTSE 350 CMD users (%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FTSE 100 CMD users (%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FTSE 250 CMD users (%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other derivatives user proportions (%)								
FTSE 350 OTR users (%)	2.80	7.50	6.80	6.80	8.10	7.70	5.70	2.90
FTSE 100 OTR users (%)	4.50	9.10	9.10	9.10	10.0	9.50	5.30	0.00
FTSE 250 OTR users (%)	0.00	5.60	4.50	4.50	5.90	5.60	6.30	6.70

According to Nguyen *et al*. (2007) in 2000 14% of US firms declared their foreign currency derivatives as net investment hedges. In 2001, this figure went up to 15%. Furthermore, 1% of the firms reported their interest rate derivatives as net investment hedges in 2000 and 2001. Similar to our results, none of the commodity derivatives was declared under net investment hedges in both years.

4.6.6.6 Comparison of net investment hedge absolute gross fair values of different derivative instruments

Figure 4.18

Distribution of net investment hedge fair value proportions amongst derivative instruments - FTSE 100.

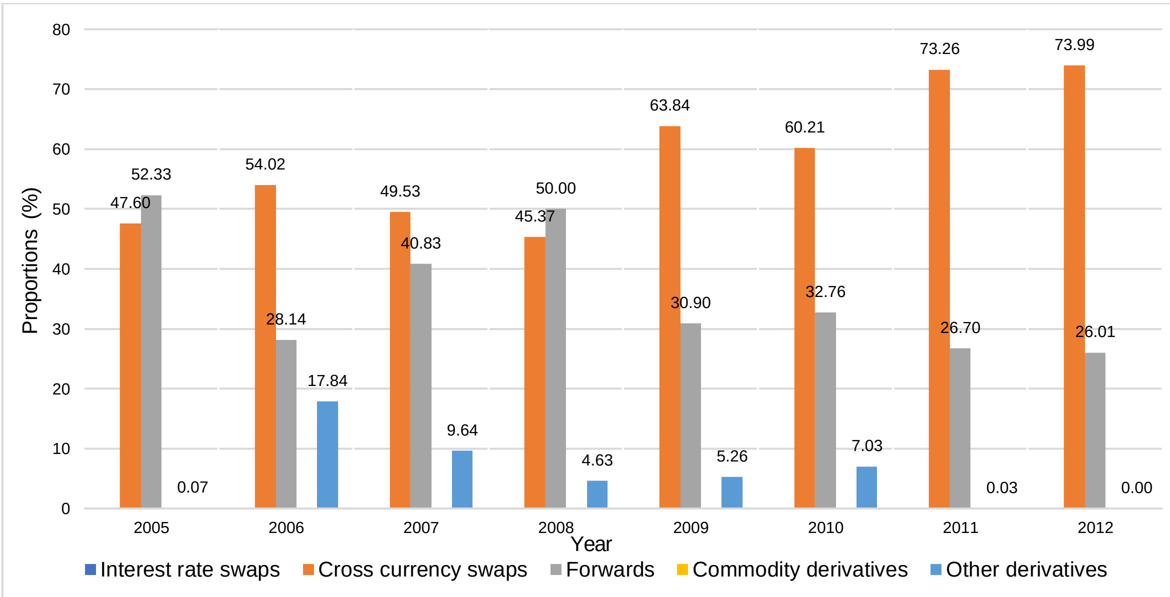


Figure 4.19

Distribution of net investment hedge fair value proportions amongst derivative instruments - FTSE 250.

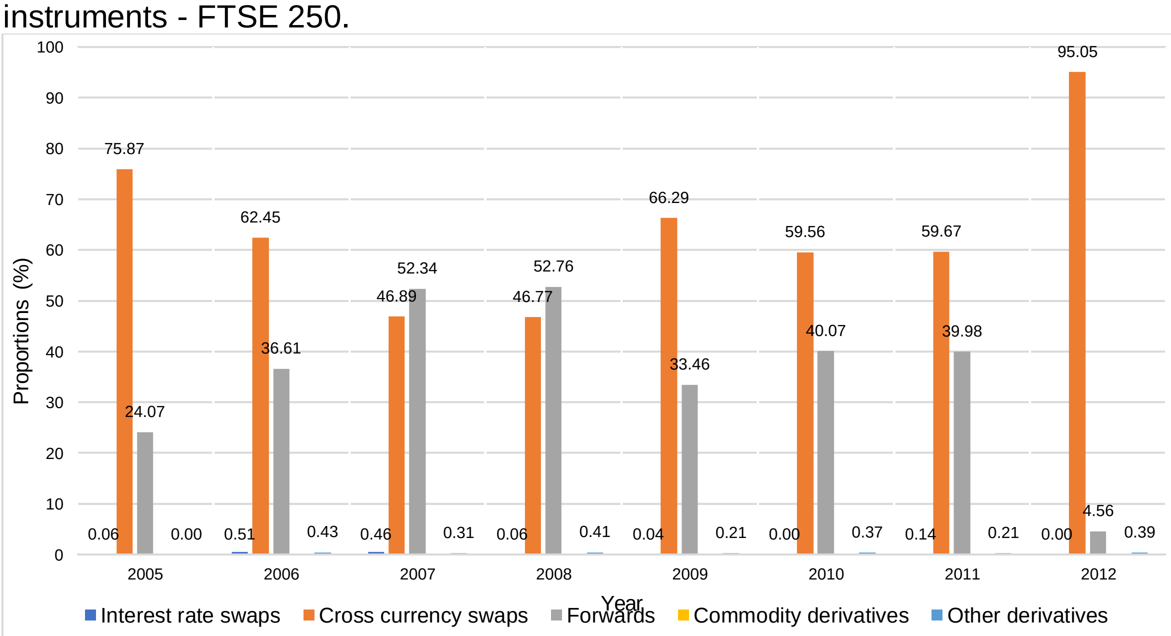


Figure 4.18 reveals that in FTSE 100 firms, with the exception of 2005 and 2008, cross currency swap fair values accounted for the largest proportion of net investment hedge fair values. In addition, there is was an upward trend in the percentage of cross currency swap fair values in larger firms during the study period. However, in 2008 fair values of forward contracts accounted for 50% of the total FTSE 100 net investment hedges fair values, while cross currency accounted for a further 45.3%. In addition, in 2006, 17.8% of FTSE 100 net investment hedge fair values were categorised as ‘other derivatives’. In 2007-2010 this remained around 4.5%-9.5%. In 2005 and 2011, there was only a small proportion of FTSE 100 net investment hedge fair values; and in 2012 cross currency swaps and forwards were the only instruments used as net investment hedges.

In FTSE 250 firms, the proportion of net investment hedges accounted as cross currency swaps decreased ahead of the financial crisis; in 2005 this figure was as high as 75.8% and by 2007 it had come down to 46.9% which resulted in forwards fair values being the highest proportion of fair values in FTSE 250 net Investment hedges. A similar figure (52.7%) was seen in 2008. However, throughout the post-financial crisis period, the proportion of cross currency swap fair values reported as net investment hedges was on an upward trend; by 2012 it was 95%. In addition, in FTSE 250 firms, only a very small proportion of Interest rate and other derivatives fair values was reported as net investment hedges and none of the commodity derivatives fair values accounted as net Investment hedges.

Several studies have suggested that disclosure and reporting requirements on derivatives usage may potentially influence firm behaviour with regards to risk management (DeMarzo and Duffie, 1995; Sapra, 2002). DeMarzo and Duffie (1995) suggested that firms may not fully hedge if detailed disaggregated disclosures for derivatives were implemented. Sapra (2002) stated that mandatory disclosures could be an influential factor for excessive speculation in the derivatives markets. This study provided evidence to demonstrate that gathering rich derivatives related data with extent level of granularity is possible in an environment where the regime of demanding accounting standards. Therefore hypothetical predictions that can be seen in the hedge accounting literature can be examined in practice as derivatives usage data is publicly available and can be fragmented to the deepest possible level of disaggregation. The next study will further expand our knowledge about derivatives usage as analysis will move to industry level (Please see appendix 3).

4.7 Conclusion

The objective of this chapter is to examine the extent of derivative financial instruments usage by UK non-financial firms listed on the London Stock Exchange from year 2005 to 2012. The study achieved this objective in several stages; initially examining the proportion of derivatives users and extended the analysis to their respective fair values. At the second stage, the investigation expanded to instrument level where usage divided into five instrument categories; namely interest rate swaps, cross currency swaps, forward currency contract, commodity derivatives and 'other derivatives' and applied the same methodology as stage one to investigate the level of their usage. At the third stage, the degree of hedge accounting usage was examined. The final stage was specifically devoted to industry level analysis where each instrument and hedging category level data was used to identify the derivatives usage among various industries. The efforts in hand collecting a richer and longer data set than previously been available has enabled this detailed analysis; which has not seen in prior studies.

Previous studies have attempted to examine the extent of derivatives use in detail. However, many suffer from externally imposed limitations such as the availability of suitable data as the complexity of today's derivatives markets poses incredible challenges in collecting and analysing data. Hence, they have limited the scope of their researches to certain categories of derivatives, or to particular industries. All of the above therefore necessitates a more granular investigation into the types of derivatives they use and the level of that usage (Carroll, O'Brien and Ryan; 2017). Given this, chapter 4 contributes to the existing literature by recording the range of derivatives currently in use by UK non-financial firms and the extent of reporting about how financial derivatives are used to mitigate the financial risk associated with their day to day operations.

In particular, the efforts in hand collecting a richer and longer data set than has previously been available further contribute to the detailed analysis to see how the demand/market for derivatives behaved during the study period to obtain the hedging benefits; that depth of information and analysis has not been seen in prior studies. Furthermore, in the literature IFRS fair value as a measure of derivatives usage is extremely rare.

Overall, this chapter contributes to our understanding of derivative reporting and disclosure practices in the UK corporate setting by providing new and comprehensive evidence regarding derivatives usage and their fair values amongst FTSE 350 non-financial firms.

In addition to the above contribution, the results show that even though the extent of detail disclosed greatly improved since the IFRS was introduced, still there is great variability across firms. Although derivatives usage data is publicly available, there are challenges for using this data (for example non-standard presentations, non-inclusion in databases); therefore only accessible to those who have the skill and resources to hand-collect data.

The findings similarly provide feedback to standard setters indicating the degree to which UK firms are adequately reporting derivatives-related information in accordance with IFRS 7; this will subsequently provide intelligence for future amendments. Also work presented in this chapter provides a demonstration for future studies highlighting what data is available. Following Chapter 5 and Chapter 6 will use this data to identify the determinants of derivatives usage and value relevance of derivatives use in FTSE 350 firms.

Chapter 5: Determinants of derivatives use amongst UK non-financial firms

5.1 Introduction

This chapter examines empirically the determinants of derivatives use by FTSE 350 non-financial firms. This study was motivated by the limited research on the economic impacts of derivative-based risk management programmes in the UK. Covering the exceptionally difficult period of the global financial crisis, it also revisits the theoretical underpinning behind the use of derivatives to reduce expected financial distress cost, external financing costs, tax liabilities and for earnings management. Furthermore, it will examine how investment opportunities, economies of scale and hedging substitutes influence firms' decisions to use derivatives, and the empirical association between firm-specific factors that influence the use of derivatives. This should lay the foundations for comparative studies in other jurisdictions to gain insights into how derivatives are used in those areas.

In section 5.2, I examine the general theoretical predictions set out in the literature and state the hypotheses to be tested. In section 5.3 the study's results are set out and examined. Finally, section 5.4 summarises the determinants behind derivatives use amongst UK non-financial firms.

5.2 Development of hypotheses and variables of interest

5.2.1 Reduce the expected cost of financial distress

Most empirical studies suggest that the relationship between expected financial distress costs and derivatives is positive (Treanor *et al*., 2014). Smith and Stulz (1985) and Froot *et al.* (1993) state that hedging leads to a decline in the expected costs of financial distress by reducing the variance of firm value, so making financially distressed firms more likely to use derivatives. This theoretical argument was investigated in the empirical literature. Nance *et al.* (1993), Mian (1996) and Minton and Schrand (1997) stated that derivative usage is correlated with capital structures, therefore less expected cost of financial distress could lead to lower contracting costs. Consistent with the above argument, Purnanandam (2008) found that firms with more debt have more incentive to use derivatives. Further, Berkman and Bradbury's (1996) empirical results led them to suggest that firms use derivatives to reduce the expected costs of financial distress by increasing firm values, based on the assumption that all derivatives are used for hedging purposes.

Even though the theoretical argument states a positive relationship between expected cost of financial distress and the use of derivatives, empirical studies showed mixed results. Nance *et al.* (1993), Sinkey and Carter (1994), Mian (1996), Minton and Schrand (1997) and Cummings *et al*. (1997) showed either weak evidence or no evidence to support the relationship between derivative usage and expected cost of financial distress based on capital structures; whereas Berkman and Bradbury (1996), Judge (2006), and Sang *et al*. (2013) found a positive relationship. The above evidence suggests that Smith and Stulz's (1985) theoretical argument of a positive relationship between hedging and reduced expected costs of financial distress is still unanswered. Therefore, in the current study, the expected costs of financial distress were incorporated using the following directional hypothesis in relation to corporate hedging with derivatives instruments. Results are presented in Table 5.1.

Hypothesis 1: Higher expected costs of financial distress is positively associated with higher derivatives use

5.2.1.1 Definition of variables

The expected costs of financial distress of firms with high debt financing depend on factors such as the amount of debt, its maturity profile, and the rates of interest. The literature has therefore extensively used leverage as a proxy for expected financial distress costs. In addition, there are several other variables used to determine the association between expected cost of financial distress and likelihood of using derivatives. Table 5.1 summarises the variables used in the literature to proxy the expected cost of financial distress.

Table 5.1
Variables used in the literature – expected cost of financial distress

Study & data description	Empirically found relationship
Smith and Stulz (1985)	
Theoretical Predictions	
(i) Leverage	Positive
(ii) Interest coverage	Negative
Froot *et al.* (1993) - Theoretical Predictions	
Theoretical Predictions	
(i) Leverage	Positive
(ii) Interest coverage	Negative
Nance *et al.* (1993)	
169 Fortune 500 and S&P 400 firms for year 1986	
Survey for all derivatives	
Variable used	
(i) Leverage	
a) 3-year average book value of long-term debt / book value of debt plus market value of equity	Negative
b) 3-year average EBIT / 3-year average total interest expense	Negative
Mian (1996)	
3,022 country firms for year 1992	
Footnotes of annual reports for all derivatives	
Variable used	
Firm size - book value of assets minus book value of common equity plus market value of common equity	Positive***
Berkman & Bradbury (1996)	
116 New Zealand firms for 1994	
Footnotes of annual reports for all derivatives	
Variable used	
(i) Book value of debt over market value of the firm	Positive**
(ii) Interest coverage defined as log of the earnings before interest and tax over interest expense	Negative***
Tufano (1996)	
48 North American gold-mining firms	
Survey for gold price hedgers	
Variable used	
(i) Leverage is measured as the book value of debt divided by the total of market value of equity plus book value of preferred stock and debt	Positive
Geczy *et al.* (1997)	
372 Fortune 500 firms for year 1990	
Footnotes of annual reports for FX derivatives	
Variable used	
(i) Interest coverage ratio defined by ratio of pretax income plus interest expense to interest expense plus capitalised interest	Negative
(ii) Long term debt ratio defined as ratio of book value of long-term debt to firm size	Negative

Howton and Perfect (1998) 451 Fortune 500/S&P 500 (FSP) firms and 461 randomly select firms for year 1994 **Variable used** (i) Leverage is the book value of a firm's debt divided by the market value of the firm's equity (ii) Interest coverage is the log of earnings before interest and taxes divided by interest expenses	 Positive* Negative
Hentschel & Kothari (2001) 425 large US firms for years 1991 -1993 Footnotes of annual reports for all derivatives **Variable used** (i) Leverage defined as the book value of liabilities divided by the market value of equity	 Positive
Graham & Roger (2002) 442 US firms for year 1995 Footnotes of 10-K submissions for all derivatives **Variable used** (i) Leverage defied as the ratio of total debts and book value of assets	 Positive***
Nguyen & Faff (2002) 469 Australian firms for year 1999 Survey for all derivatives **Variable used** (i) Leverage calculated as the sum of short-term and long-term debt scaled by the market value of equity plus total debt.	 Positive***
Judge (2006) 500 large UK firms for year 1995 Footnotes of annual reports and surveys for all derivatives **Variable used** (i) Net gearing defined as the book value of net debt (net debt is total debt less cash and short-term investments) and preference capital as a proportion of the book value of net debt plus the book value of equity (ii) Interest coverage defined by profit before interest and tax divided by interest payments	 Positive** Negative
Bartram, Brown & Fehle (2009) 7263 firms from 48 countries for year 2000 or 2001 Footnotes of annual reports for all derivatives **Variable used** (i) Leverage defined as total debt / sum of market capitalisation, total debt and preferred stock (ii) Interest coverage defined as EBIT / interest expense on debt (3-year average)	 Positive*** Negative*
Birt *et al.* (2013) 7263 firms from 48 countries for year 2000 or 2001 Footnotes of annual reports for all derivatives **Variable used** (i) Leverage defined as total debt/total assets	 Positive***
Velasco (2014) 74 Philippine firms for year 2007 or 2011 Footnotes of annual reports for all derivatives **Variable used** (i) Leverage defined as ratio of book value of debt to market value of equity	 Positive*

In table 5.1 significance levels at 1%, 5% and 10% were indicated with ***, **, * respectively. Table 5.1 shows that leverage and interest coverage are the most frequently used variables to examine the expected cost of financial distress hypothesis. As leverage is the only variable that appeared to be in a positive relationship with derivatives use, similar to Lel (2012), this study used leverage, defined as total debt divided by total assets, to examine the expected cost of financial distress hypothesis. The theory suggests that firms with higher borrowing will use more derivatives, thus the current study expects to see a higher derivative usage amongst firms with higher levels of debt.

5.2.2 Tax benefit hypothesis

Smith and Stulz (1985) argued that the structure of the tax system can make it beneficial for firms to use derivatives as hedging reduces the expected tax liability by reducing the variability in pre-tax income in a world where firms face a convex tax function. Literature suggests that the convexity of the tax function arises due to the presence of tax shields such as tax credits from investments, existence of marginal tax rates and carried forward tax losses (Smith and Stulz, 1985; Nance, Smith and Smithson, 1993; Berkman and Bradbury, 1996; Mian, 1996; Tufano, 1996; Cummins *et al.*, 1997; Geczy, Minton and Schrand, 1997; Graham and Smith, 1999).

The findings from the above studies were that the more convex the tax function or firms with greater tax preference items, more likely the firms were to involve in hedging. The involvement of tax in corporate hedging was investigated using the following hypothesis; the reasoning for using carried forward tax losses is describe in section 5.2.2.1.

Hypothesis 2: Firms with carried forward tax losses are more likely to hedge.

5.2.2.1 Definition of variables

In literature, there are various proxies used to measure the impact of tax on hedging. Table 5.2 summarises these variables.

Table 5.2
Variables used in the literature – tax benefits

Study & data description	**Empirically found relationship**
Smith and Stulz (1985)	
Theoretical Predictions	
(i) Income in progressive region of tax schedule	Positive
(ii) Tax losses carried forward	Positive
(iii) Tax credits	Positive
Froot *et al.* (1993)	
Theoretical Predictions	
(i) Income in progressive region of tax schedule	Negative
(ii) Tax losses carried forward	Negative
Nance *et al.* (1993)	
Variables used	
(i) Tax losses carried forward – Binary variable	Negative
(ii) Book value of the investment tax credits	Positive
(iii) An indicator variable to show the probability of firms' pre-tax income in the progressive tax region	Positive
Berkman & Bradbury (1996)	
Variable used	
firms with losses carried forward the tax loss variable equals 1, and 0 otherwise	Positive**
Tufano (1996)	
Variable used	
Tax losses carried forward scaled by firm value	Positive
Mian (1996)	
Variables used	
(i) Dummy variable for tax losses carried forward	Negative
(ii) Dummy variable for foreign tax credits	Positive***
Wysocki (1996)	
Variables used	
(i) Net operating losses applied as a reduction of taxable income	Positive
(ii) Indicator variable equal 1 if firm has investment tax credits on its balance sheet	Positive
Geczy *et al.* (1997)	
Variable used	
Book value of net operating loss carry forwards scaled by total assets	Positive
Gay and Nam (1998)	
Variables used	
(i) Tax losses carried forward - net operating losses scaled by the book value of assets	Negative Positive

(ii) Book value of the investment tax credits	Positive
(iii) An indicator variable to show the probability of firms' pre-tax income in the progressive tax region	
Howton and Perfect (1998)	
Variable used	
(i) Tax loss dummy equals 1 if a firm has loss to carry forwards, else zero	Negative
(ii) The tax progressivity dummy equals 1 if a firm's pre-tax income falls within three standard deviations of the progressive region, otherwise zero	Positive***
Graham & Roger (2002)	
Variable used	
(i) Net operating loss carry forward scaled by book value of assets	Negative**
Judge (2006)	
Variable used	
(i) A dummy variable for tax losses carried forward	Positive***
Bartram *et al.* (2009)	
Variable used	
(i) Tax credits - a dummy variable equal to 1 if credits are nonzero; 0 otherwise	Positive***
Lel (2012)	
Variable used	
(i) The ratio of net operating losses to net sales	Negative
Velasco (2014)	
Variable used	
(i) The natural logarithm of unused net operating loss carried overs	Positive*

Significance levels at 1%, 5% and 10% were indicated with ***, **, * respectively.

Graham and Smith (1999) suggested that the firms with net operating losses carried forward have an incentive to hedge if the firm is expecting profits, as it increases the tax shield. This argument has been widely tested in the literature using a dummy variable to indicate the carried forward tax losses (Mian, 1996; Berkman and Bradbury, 1996; Howton and Perfect, 1998; Allayannis and Ofek, 2001; Berkman *et al.*, 2002). Therefore, in the current study the tax hypothesis predicts that the likelihood of hedging is positively related to carried forward net operating losses.

In order to examine the impact of taxation on the use of derivatives, the current study used an indicator variable if a firm carried forwards tax losses, proxied by carried forward net operating losses. Since provisions of tax losses carried forward could significantly influence the firm's taxable income, the coefficients of the tax variable were predicted to be positive in the current study.

5.2.3 Underinvestment costs and the external financing hypothesis

Myers (1977), Smith and Stulz (1985) and Bessembinder (1991) argued that financially distressed firms may disregard positive net present value (NPV) projects due to bondholders having priority over benefits by those projects at the expense of shareholders; hence hedging will help to reduce the agency cost of underinvestment by reducing the probability of expected financial distress cost. Theory also suggests that the underinvestment problem is higher for highly leveraged firms as these firms have significant growth options embedded in their investment set. This provides the basis for supporting underinvestment costs and the external financing hypothesis.

Hypothesis 3: Firms with higher underinvestment costs have a greater incentive to hedge

5.2.3.1 Definition of variables

Table 5.3 summarises the variables used in the literature to proxy underinvestment costs and the external financing argument.

Table 5.3

Variables used in the literature – underinvestment costs and the external financing

Study & data description	Empirically found relationship
Nance *et al*.1993	
Variables used	
(i) R&D expenses / book value of debt plus market value of equity	Positive
(ii) Book value of assets / book value of debt plus market value of equity	Negative
Mian (1996)	
Variable used	
Market-to-book ratio - market value of common equity plus the book value of preferred equity and liabilities / book value of total assets	Positive***
Wysocki (1996)	
Variable used	
Total assets minus total liabilities less preferred stock over market value of the firm	Positive
Geczy *et al*. 1997	
Variable used	
Research and development expenditures to sales	Positive
Howton and Perfect, 1998	
Variable used	
The ratio of the three-year average R&D cost divided by sales	Positive**

Graham and Rogers, 2002 **Variable used** (i) R&D expenses scaled by book value of assets (ii) Book to market ratio of equity	 Negative** Positive***
Nguyen & Faff (2002) **Variable used** (i) The ratio of market to book value (ii) Liquidity calculated as the ratio of cash and cash equivalents scaled by firm size (iii) Current ratio defined as the ratio of short term assets over short-term liabilities	 Negative* Negative Negative
Borokhovich *et al*. 2004 **Variable used** (i) R&D expenses scaled by total assets (ii) Quick ratio calculated as current assets minus inventory over current liabilities	 Positive Negative
DaDalta, Lina and Linb (2012) **Variable used** Ratio of R&D expenses to total assets	 Positive***
Velasco, 2014 **Variable used** The ratio of market value of equity to book value of equity	 Positive**

Significance levels at 1%, 5% and 10% were indicated with ***, **, * respectively.

Table 5.3 shows that previous empirical studies used two main variables to examine the underinvestment hypothesis: (i) market-to-book ratio; and (ii) research and development expenditures scaled by firm size. R&D expenses have been shown to have a statistically significant positive relationship with derivatives use. However, there are inconsistent results from almost every study[31] using market-to-book ratios, with either the sign of the estimated coefficients being different or insignificant, indicating that the underinvestment hypothesis has no relevance to hedging.

There are arguments against using R&D expenses to test the underinvestment costs hypothesis. Froot *et al.* (1993) argued that R&D expenditure captures not only firm growth but also asymmetric information about the quality of proposed projects and firm's intangible assets. They also suggested that as lenders do not consider intangible assets as suitable collateral due to valuation difficulties, firms with higher intangible assets face difficulty in raising external financing.

[31] Gay and Nam (1998) found a positive relationship between derivatives use and market to book ratio

In order to examine the underinvestment cost hypothesis, the current study uses three variables. Firstly, the research and development (R&D) expenses defined as R&D expenses over total sales. Following Geczy *et al.* (1997) and Borokhovich *et al.* (2004), the current study used quick ratio as the second proxy to test the underinvestment cost and external financing argument. Geczy *et al.* (1997) found that quick ratio is associated with currency derivatives. Borokhovich *et al.* (2004) argued that quick ratio represents the availability of internal funds, therefore it can be interpreted as being consistent with derivative use as a means of reducing the underinvestment problem. In the current study, quick ratio is measured by total of cash & equivalents and net receivables scaled by total current liabilities. Finally, similar to Lel (2012), financing needs were measured by the ratio of capital expenditures minus cash flows from operating activities to total assets.

5.2.4 Firm size and derivative use

Derivatives use, its reporting and disclosure require highly skilled human input as well as an advanced technological infrastructure. This can result in large firms being in a better position to get involved in derivatives transactions. Furthermore, size provides firms with economies of scale in relation to bearing the costs related to running a costly risk management programme. The literature review also shows that almost in all cases larger firms had a higher percentage of derivatives usage irrespective of the method used in each study to reach that conclusion.

Further, larger firms tend to trade in wider geographical areas in different currencies, exposing them to a greater foreign exchange risk; hence one can expect a higher use of derivatives, particularly in the area of FX derivatives. Therefore, similar to Berkman and Bradbury, 1995; Phillips, 1995; Bodnar *et al*., 1995; Berkman *et al.,* 1997; Berkman *et al*., 2002; and Lievenbrueck and Schmid, 2013, this study expects firm size to be a positively related factor with derivatives use. This was examined using the following hypothesis.

Hypothesis 4: Greater firm size is positively associated with more extensive use of derivatives

Prior empirical work used the natural logarithm of total assets to examine the effects of firm size on derivatives use (Graham and Rogers, 2002; Birt *et al*., 2013; Hagelin, 2003). Some studies carried out a sensitivity analysis using the natural logarithm of total sales, although the results showed no significant difference.

5.2.5 Firms with alternative hedging strategies have less incentive to hedge using derivative instruments

One argument supporting alternative hedging techniques was provided by Nance, Smith, and Smithson (1993), where they argued that firms with expected financial distress costs could reduce that burden by issuing convertible debt or preferred stock; hence a negative relationship with usage of derivatives. In addition, they argued that firms with higher short-term liquidity are less likely to encounter any expected financial distress cost related to long-term debt and were therefore less likely to use derivatives. Additionally, they suggested that a higher quick ratio is an indication of good supply of internal funds, hence less likely use of derivatives. In general the availability of alternatives to derivatives is highly likely to influence the need for derivatives.

The involvement of other hedging instruments on derivatives use was therefore examined using the following hypothesis.

Hypothesis 5: Firms with alternative hedging instruments are less likely to use derivatives

Literature used measures such as liquidity, preferred stocks, convertible debt, dividend ratio to proxy for alternative hedging instruments (Nance *et al*., 1993; Geczy *et al*., 1995; Berkman and Bradbury, 1996; Mian, 1996; Tufano, 1996). Amongst these, liquidity and dividend are the most frequently used variables to proxy for alternative hedging instruments; therefore, the current study used liquidity (defined as the log of current assets minus inventory over current liabilities) and dividend (a dummy variable with the value of 1 if dividends per share are positive, zero otherwise) to examine the above hypothesis.

5.2.6 Cash flow volatility and derivative use

Volatility in cash flows could lead to a liquidity crisis where firms have no adequate funds to satisfy their payment obligations. Empirical results show that firms can use hedging to reduce cash flow volatility (Bessembinder, 1991; Froot *et al*., 1993; Bartram *et al*., 2006). Hedging cash flow volatility also reduces dependence on external financing, which in turn reduces underinvestment (Minton and Schrand, 1998). Additionally, floating-rate credit could increase cash flow volatility as changes in interest rates can have an impact on the ability of firms to generate income. Considering the above, the current study expects a negative association between derivatives use and cash flow volatility; hence it has used the following hypothesis to examine this relationship.

Hypothesis 6: Use of derivatives is negatively associated with cash flow volatility.

In the current study cash flow volatility is calculated using net cash flows from operating activities over total assets.

In order to identify the determinants of derivatives usage the next step is to select a suitable approach based on prior literature as this will enable the rationales behind the variables included in the models to be established, how they were measured and ex ante predictions for the variables; also to see alternative explanations and/or hypotheses that might be tested. This is extensively covered in section ‘3.5 Approach and measures – Determinants.’

5.3 Empirical Results

This section presents the empirical results of the chapter 5. It begins by describing the posited explanators of derivatives use, followed by the factors for using hedge accounting. Finally, it examines the drivers for selecting different hedging categories to report derivatives as well as to disclose derivatives as FVTPL.

5.3.1 Determinants of derivatives use

5.3.1.1 Determinants of derivatives use - descriptive statistics of independent variables

As discussed earlier in the chapter, the hypothesised explanators for extent of derivatives usage are expected costs of financial distress, presence of carried forward tax losses, underinvestment costs, cash flow volatility, economies of scale and presence of alternative hedging instruments. The table below shows the descriptive statistics of independent variables used in the study.

Table 5.4 shows that in the current study mean leverage and its standard deviation in FTSE 350 non-financial firms were 0.224 and 0.178 respectively. The current study used a dummy variable to examine the involvement of tax losses on derivatives use, where this value equals zero if there are no carried forward losses; one otherwise. Berkman and Bradbury (1996) suggest that using a dummy variable to proxy tax hypothesis avoids the scaling problem highlighted by Nance *et al*. (1993)[32]. The above data shows that 9.8% of firms had carried forward tax losses during the study period.

---

[32] Please see Nance *et al.* (1993) p. 272 for detailed discussion.

Table 5.4
Descriptive statistics of independent variables - determinants of derivatives use

Variable	Predicted Sign of association with derivative usage	Mean	Std. Dev.	Min	Max
Financial distress hypothesis					
Leverage	+	0.224	0.178	0.000	1.345
Tax benefit hypothesis					
Tax	+	0.098	0.298	0.000	1.000
Under investment cost / external financing hypothesis					
R&D expenses	+	0.042	0.078	0.000	0.585
Quick ratio	-	1.213	2.333	0.000	9.373
Financing needs	+	-0.068	0.127	-2.293	0.654
Cash flow volatility	-	0.121	0.122	-0.291	2.340
Firm size	+	14.176	1.639	9.340	19.206
Alternative hedging instruments					
Liquidity	-	-0.056	0.704	-3.340	3.912
Dividend pay out	+	0.853	0.354	0.000	1.000

Table 5.4 reports the descriptive statistics of independent variables used in the analysis. There are 1825 observations over the period 2005 to 2012. The size of the firm is defined as the log of the total assets where total assets represent the sum of total current assets, long term receivables, investment in unconsolidated subsidiaries, other investments, net property plant and equipment and other assets. Leverage is defined as the total debt divided by total assets. Tax equals 1 for firms with carry forward losses, zero otherwise. Liquidity is given by the log of current assets minus inventory over current liabilities. The dividend is determined by a dummy with a value of 1 if dividends per share are positive, zero otherwise. Research & Development is measured by R&D expenses cost scaled by net sales. Quick ratio is measured by the total of cash & equivalents and net receivables over current liabilities. Financing needs are examined using the difference between capital expenditures and net cash flows from operating activities over total assets. Cash flow volatility is measured using net cash flows from operating activities over total assets.

The impact of underinvestment costs on derivatives usage was measured by three proxies: firstly, R&D expenses and secondly quick ratio and finally financing needs. Quick ratio is defined as total of cash and equivalents and net receivables scaled by total current liabilities; financing needs were measured by the ratio of capital expenditures minus cash flows from operating activities to total assets; and R&D expenses measured by the ratio of research and development expenses to net sales. Table 5.4 shows that the mean quick ratio was 1.213 (std. dev was 2.333) while minimum and maximum fluctuate between zero and fifty. This indicates that some of the FTSE 350 firms during the study period were struggling to meet their short term financial obligations with liquid assets while some firms had extremely good short-term liquidity positions. In addition, the mean R&D variable value was 0.042 (std. var.

was 0.078) suggesting that on average firms are spending less on R&D compared to than net sales. Furthermore, the data reveals that some firms invested heavily in R&D, close to 58% of their net sales value.

The current study constructed a cash flow volatility variable by scaling cash Inflows from operating activities by total assets to assess how derivatives use influenced cash flow volatility. The above data shows that the proportion of mean net cash flows from operating activities over total assets was 0.121. Bartram *et al.* (2011) find a significantly lower cash flow volatility for derivative users, suggesting that for a given level of debt derivatives could reduce the volatility of cash flows leading to a reduced expected cost of financial distress.

Mean firm size showed as 14.176 while standard deviation was 1.639. Firm size is included in the analysis to control for economies of scale in using derivatives proxied by the log of total assets. Liquidity, given by the log of current assets minus inventory over current liabilities, was used as a proxy for hedging substitute. Berkman and Bradbury (1996) suggested that firms with more liquid assets are less likely to hedge as they have larger financial buffers. In the current study mean liquidity is -0.056 (std. dev. is 0.704) while the minimum was 0.704 and the maximum was 3.912. Nance *et al*. (1993) suggest that firms with higher level of liquidity are faced with a relatively lower level of financial risk, meaning that firms that hold fewer liquid assets are more likely to face expected financial distress cost. The above negative mean liquidity value suggests that during the 2007/2008 financial crisis the largest listed UK non-financial firms may have faced with poor liquidity issues leading to higher level of expected financial distress cost.

Table 5.5 reports the means and the medians of the firms reporting the use of derivatives in their financial years from 2005 to 2012 and for those that did not. The statistical significance of differences in the medians for derivatives users and non-users was evaluated using the non-parametric Mann-Whitney U test. The Mann-Whitney U test uses the Z-test to compare the distribution of each group.

Table 5.5
Univariate nonparametric tests – derivatives use

Variable	Firms without Derivatives Firm years = 348 Mean	Median	Firms with Derivatives Firm years = 1475 Mean	Median	Z-value (using Difference via Wilcoxon rank-sum (Mann-Whitney) test	P-value
Financial distress hypothesis						
Leverage	0.137	0.065	0.245	0.232	-12.170	0.000***
Tax benefit hypothesis						
Tax	0.117	0.000	0.093	0.000	1.354	0.176
Under investment cost / external financing hypothesis						
R&D expenses	0.074	0.018	0.037	0.008	1.781	0.075*
Quick ratio	2.037	1.061	1.019	0.826	5.783	0.000***
Financing needs	-0.094	-0.064	-0.062	-0.054	-1.951	0.051*
Cash flow volatility						
Cash flow volatility	0.157	0.123	0.112	0.098	3.740	0.000***
Firm Size						
Firm size	12.961	12.915	14.463	14.331	-15.330	0.000***
Alternative hedging instruments						
Liquidity	0.201	0.200	-0.116	-0.104	7.044	0.000***
Dividend pay out	0.690	1.000	0.891	1.000	-9.431	0.000***

In table 5.5 derivatives users are the firms that reported interest rate swaps, cross currency swaps, forwards, commodity derivatives or any other form of derivatives fair values at the end of financial years 2005 to 2012. Non-users are the firms that did not report any of these derivative categories at the respective balance sheet dates. The firm size is defined as the log of the total assets where total assets represent the sum of total current assets, long term receivables, investment in unconsolidated subsidiaries, other investments, net property plant and equipment and other assets. Leverage is defined as the total debt divided by total assets. Tax equals 1 if firms had carry forward losses, zero otherwise. Liquidity is given as the log of current assets minus inventory over current liabilities. Dividend pay-out is determined by a dummy with a value 1 if dividends per share are positive, zero otherwise. R&D expenses measured by research and development expenses cost scaled by net sales. Quick ratio is measured by the total of cash & equivalents and net receivables over current liabilities. Financing needs were examined using the difference between capital expenditures and net cash flows from operating activities over total assets. Cash flow volatility is measured using net cash flows from operating activities over total assets. The Z-statistics and p-values in table 5.5 are based on the Two-sample Wilcoxon rank-sum (Mann-Whitney) test, which examines the differences in the medians between derivatives user firms and non-user firms. The one-tailed p-values for coefficient estimates are reported in the table and significance levels at 1%, 5% and 10% were indicated with ***, **, * respectively.

As indicated by the p–values, non-users are significantly different from users with respect to leverage, quick ratio, cash flow volatility, firm size, liquidity, and dividend pay-out ratio at the 1% significance level while R&D expenses and financing needs are statistically different at the 10% level.

Consistent with theory, derivative users have a higher leverage value and lower level of quick ratio, cash flow volatility and liquidity, indicating a higher level of financial constraints. However, R&D expenses amongst derivative users were lower than non-users which was different to the predictions; although, as explained earlier, this difference is only significantly different at the 10% level. In addition, consistent with the theoretical predictions, 89% of the derivatives users declared dividends during the study period, whereas only 69% of non-derivatives users declared dividends. The mean firm size of derivatives users is larger than that of non-users, supporting the presence of information and scale economies for using derivatives.

Tax hypothesis suggests that derivative users should have higher tax loss carry forwards compared with non-users. The difference in the extent of carry-forward tax losses as between derivatives users and non-users is not statistically significant at any generally acceptable level. Therefore, theory as regards the tax hypothesis is not substantiated in aggregate by simple univariate analysis of carry-forward losses amongst FTSE 350 non-financial firms over the sample period.

Table 5.6
Pearson correlation matrix - independent variables of total derivatives usage

Variable	**Size**	**Leverage**	**Tax**	**Liq**	**Div**	**R&D**	**Quick**	**Fin needs**	**Cash flow**
Size	1.0000								
Leverage	0.2658*	1.0000							
Tax	-0.0515*	0.0790*	1.0000						
Liq	-0.2843*	-0.2456*	0.0531*	1.0000					
Div	0.1701*	0.0564*	-0.3465*	-0.1526*	1.0000				
R&D	-0.2688*	-0.3245*	0.0715*	0.3498*	-0.2698*	1.0000			
Quick	-0.1698*	-0.1634*	0.0827*	0.6275*	-0.1945*	0.3199*	1.0000		
Fin needs	0.1964*	0.1885*	0.2217*	-0.0208	-0.1890*	-0.0341	0.0590*	1.0000	
Cash flow	-0.2163*	-0.1681*	-0.2010*	0.0724*	0.1226*	-0.0225	-0.0154	-0.9195*	1.0000

In table 5.6 Size is the log of the total assets where total assets represent the sum of total current assets, long term receivables, investment in unconsolidated subsidiaries, other investments, net property plant and equipment and other assets. Leverage is the total debt divided by total assets. Tax is an indicator variable which takes the value 1 if firms have carry forward losses, zero otherwise. Liq is the log of current assets minus inventory over current liabilities. Div is a dummy variable with a value of 1 if dividends per share are positive, zero otherwise. R&D is measured by research & development expenses cost scaled by net sales. Quick is the total of cash & equivalents and net receivables over current liabilities. Fin needs were examined using the difference between capital expenditures and net cash flows from operating activities over total assets. Cash flow is net cash flows from operating activities over total assets. A star next to the correlation score indicates that the result is statistically significant at 5% level.

Table 5.6 presents the Pearson correlation matrix of the independent variables used in the determinants of the derivatives usage study. The largest absolute value correlation is 91.95%; between cash flow volatility and financing needs variables. The smallest correlation can be seen between cash flow volatility and quick ratio (1.54%). Statistically significant correlation coefficients suggest multicollinearity in independent variables. The remaining correlation coefficients are between -0.3465 (dividend pay-outs and tax) and 0.3498 (R&D and liquidity) indicating a low overall level of severity. Berkman and Bradbury (1996) suggested that this level of correlation is low severity; hence the results of multivariate analysis are unlikely to be distorted by multicollinearity[33].

5.3.2 Estimation model selection process

Tests have been applied wherever pertinent in this research to determine the most appropriate approach to estimation of multivariate models as between pooled OLS, panel with fixed effects (FE) or panel with random effects (RE). In pooled panel data OLS models, data on different firms is pooled together without controlling for individual differences. FE models control for all time-invariant differences between the firms, therefore estimated coefficients of the fixed-effects models cannot be biased because of omitted time-invariant characteristics, while RE models assumes that firm differences are captured by the intercept; hence they are uncorrelated with the explanatory variables in the model. Model selection process has three stages and follow all concerned with selection of the right estimation approach for the logit.

[33] Gujarati (2004) suggests two remedial measures with regards to multicollinearity, do nothing or follow some rules of thumb. Further he suggests that "sometimes we have no choice over the data we have available for empirical analysis" (p.363).

a) Estimation model selection process - Stage 01: OLS vs logit with fixed effects

Table 5.7

Conditional fixed-effects logistic regression	Number of observations = 543
Group variable: Firm	Number of groups = 71
	Obs per group: min = 3
	avg = 7.6
	max = 8
	LR chi2(8) = 41.15
Log likelihood = -184.53584	Prob > chi2 = 0.0000

Variable	Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]
Leverage	5.356	1.381	3.88	0.000	2.650	8.062
Tax	0.773	0.494	1.56	0.118	-0.196	1.742
Quick	-0.228	0.124	-1.83	0.067	-0.471	.0156
Fin needs	-4.238	3.127	-1.36	0.175	-10.367	1.891
Cash flow	-3.087	3.286	-0.94	0.347	-9.528	3.353
Size	0.879	0.256	3.44	0.001	0.378	1.380
Liq	0.696	0.389	1.79	0.074	-0.067	1.459
Div	0.245	0.428	0.57	0.568	-0.594	1.083

Table 5.7 results compare the suitability of the results of OLS with the results of the logit model with fixed effects. As OLS is a restricted model, the rejection of H_0 indicates the presence of changes over time. In the above, less than 0.05 value of "Prob > chi2" suggests a rejection of the null hypothesis; hence the logit model with fixed effects is a better comparison with the OLS model[34].

[34] In order to prevent losing the number of observation in regressions due to missing data in Datastream, R&D variable here onwards has been dropped from regression analysis in chapter 5. As both quick ratio and financing needs variables are simultaneously examining under investment cost / external financing hypothesis benefit of eliminating R&D expenses should overweight the disadvantages of losing a higher number of data points.

b) Estimation model selection process - Stage 2: OLS vs logit with random effects (Breusch and Pagan Lagrange multiplier test)

The Breusch and Pagan Lagrange Multiplier test has been used to examine the properties of the random effects model based on the pooled OLS residuals.

Table 5.8

Random-effects logistic regression	Number of observations = 1791
Group variable: Firm	Number of groups = 237
	Obs per group: min = 1
	avg = 7.6
	max = 8
	Wald chi2(8) = 79.84
Log likelihood = -473.88785	Prob > chi2 = 0.0000

Variable	Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]
Leverage	5.466	1.127	4.85	0.000	3.257	7.675
Tax	0.694	0.453	1.53	0.126	-0.195	1.583
Quick	-0.147	0.075	-1.95	0.051	-0.294	0.001
Fin needs	-4.906	2.840	-1.73	0.084	-10.472	0.660
Cash flow	-4.232	2.917	-1.45	0.147	-9.949	1.485
Size	1.220	0.179	6.82	0.000	0.869	1.570
Liq	0.463	0.298	1.55	0.121	-0.122	1.047
Div	0.627	0.400	1.57	0.117	-0.158	1.412
Cons	-14.805	2.417	-6.13	0.000	-19.542	-10.069
lnsig2u	2.369	0.209			1.958	2.779
sigma_u	3.268	0.342			2.662	4.012
rho	0.765	0.038			0.683	0.830

Breusch and Pagan Lagrange multiplier test for random effects

User[Firm,t] = Xb + u[Firm] + e[Firm,t]

Estimated results:

	Var	sd = sqrt(Var)
User	0.151	0.389
e	0.058	0.241
u	0.067	0.259

Test: Var(u) = 0

chibar2(01) = 1570.19

Prob > chibar2 = 0.0000

Table 5.8 compares the results of OLS with the results of the logit model with random effects. “Prob > chibar2” of less than 0.05 suggests a rejection of the null hypothesis; hence the RE model suits better comparison with the pooled OLS model.

c) Estimation model selection process - Stage 03: FE vs RE model (Hausman test)

In order to determine suitability between the logit fixed vs logit random effects models, the Hausman test has been used. The Hausman test examines whether individual effects are uncorrelated with the other regressors in the model.

Table 5.9

	---- Coefficients ----			
	(b)	(B)	(b-B)	sqrt(diag(V_b-V_B))
	FE	RE	Difference	S.E.
Leverage	5.356	5.466	-0.110	0.798
Tax	0.773	0.694	0.079	0.197
Quick	-0.228	-0.147	-0.081	0.099
Fin needs	-4.238	-4.906	0.669	1.309
Cash flow	-3.087	-4.232	1.145	1.513
Size	0.879	1.220	-0.340	0.183
Liq	0.696	0.463	0.234	0.250
Div	0.244	0.627	-0.383	0.151

b = consistent under Ho and Ha;

B = inconsistent under Ha, efficient under Ho;

Test: Ho: difference in coefficients not systematic

chi2(8) = chi2(8) = (b-B)'[(V_b-V_B)^(-1)](b-B)

= 39.86

Prob>chi2 = 0.0000

Table 5.9, with a “Prob > chi2” of less than 0.05, suggests a rejection of the null hypothesis that the individual effects are correlated with regressors; therefore the FE model is preferred over the RE model. Considering the above, the step 1 - step 3 results in the FE model being identified as the most appropriate model to determine the decision to use derivatives in this study.

5.3.3 Logit regression results - determinants of decision to use derivatives

This section shows the results from the logit regression model. The following logit specification was used.

$$In\left(\frac{P_{Fx,it}}{1-P_{Fx,it}}\right) = \alpha + \beta_1(\text{leverage})_{it} + \beta_2(\text{tax})_{it} + \beta_3(\text{quick})_{it} +$$

$$\beta_4(\text{fin\_needs})_{it} + \beta_5(\text{cash\_flow})_{it} + \beta_6(\text{size})_{it} + \beta_7(\text{liquidity})_{it} + \beta_8(\text{dividend})_{it} + \varepsilon_{it}$$

where $P_{Fx,it}$ is the probability that firm *i* uses derivatives at time *t*, where the binary variable is assigned a value of one if a firm reported derivative fair values at its financial year end date, zero otherwise[35].

Table 5.10 presents the results for determinants of derivatives usage using a panel logit with fixed effects implementation. In order to determine whether time-fixed effects were needed when running a FE model, the joint significance of the time dummies was investigated; results were statistically at 1% level of significance. To investigate the simultaneous effects of independent proxy variables that represent the hedging theories on derivatives use, a value of one was assigned to the dependent variable where there were positive or negative fair values of derivatives disclosed in annual reports.

Similar to the majority of previous empirical results (Graham and Rogers, 2002; Birt *et al*., 2013), the current study shows an estimated coefficient on leverage to be positive and statistically significant. In this study the significance is at 5%. Further results indicate that firm size is an influential in determining the use of derivatives. Table 5.10 shows that when the firm size increased by one log unit, the likelihood of using derivatives has doubled exp(0.691). Consistent with the expectations of the study (see section 5.2.1), coefficient estimates of leverage and quick ratio were in line with predictions, and significance at the 5% level. Further, coefficient estimates of leverage suggest that use derivatives increase with increasing leverage. This indicates that UK larger firms are highly concerned when their assets are declining or

[35] The same logistics model has been used throughout the chapter 5 with different dependent variables to represent the determinant item in question when logistics regression is used.

their debt is on an upward trend, supporting the financial distress hypothesis that states that derivatives use increases with a higher proportion of debt. The above results also suggest that derivatives use was decreasing in 2011-2012, where as between 2005 – 2010 it shows a gradual increase.

Table 5.10

Logit regression results - determinants of corporate use of derivatives

Independent Variables	Predicted sign	Coefficient estimate	Std. Err	t value	P-value
Financial distress hypothesis					
Leverage	+	4.275**	2.009	2.13	0.018
Tax benefit hypothesis					
Tax	+	0.672	0.640	1.05	0.148
Under investment hypothesis					
Quick	-	-0.230**	0.110	-2.09	0.020
Fin_needs	+	-1.619	3.880	-0.42	0.339
Cash flow volatility					
Cash flow	-	-1.289	4.584	-0.28	0.389
Firm size					
Size	+	0.691**	0.502	1.38	0.086
Alternative hedging instruments					
Liq	-	0.795	0.560	1.42	0.080
Div	+	0.363	0.660	0.55	0.292
Year					
2006		1.014***	0.399	2.54	0.006
2007		1.201***	0.477	2.52	0.007
2008		1.917***	0.567	3.38	0.000
2009		1.519***	0.513	2.96	0.002
2010		1.275***	0.539	2.37	0.010
2011		1.005**	0.590	1.70	0.046
2012		0.598	0.636	0.94	0.175

Log likelihood	: -172.9665	Number of obs	: 543
F(15,70)	: 3.39	Group variable	: Firm
Prob > F	: 0.0003	Number of groups	: 71

Table 5.10 reports the results of determinants of corporate use of derivatives obtained using FE logit regression, and results are based on 543 observations analysed as panel data. Derivatives use dependent variable is set to 1 if firms use any type of derivatives; otherwise 0. The firm size is defined as the log of the total assets where total assets represent the sum of total current assets, long term receivables, investment in unconsolidated subsidiaries, other investments, net property plant and equipment and other assets. Leverage is defined as the total debt divided by total assets. Tax equals 1 if firms have carry forward losses, zero otherwise. Liquidity is given by the log of current assets minus inventory over current liabilities. Dividend pay-out is determined by a dummy with a value of 1 if dividends per share are positive, zero otherwise. Quick ratio is measured by the total of cash & equivalents and net receivables over current liabilities. Financing needs are examined using the difference between capital expenditures and net cash flows from operating activities over total assets. Cash flow volatility is measured using net cash flows from operating activities over total assets. One tailed significance levels at 1%, 5% and 10% are indicated with ***, **, * respectively.

In order to see if the 2007/2008 global financial crisis had any impact on the results in Table 5.10, the regression model was executed without the data from the 2007 and 2008 financial years. The results show that leverage remained significant at the 5% level, confirming that irrespective of the global financial crisis financially distressed firms are likely to use derivatives. Size is also remained significant at 5% level.

5.3.4 Tobit regression results - determinants of corporate use of derivatives

This section shows the results from the Tobit regression model. Therefore, the Tobit model is defined as follows:

$User_{it} = \beta_0 + \beta_1(Size_{it}) + \beta_2(Lev_{it}) + \beta_3(Fin\_dis_{it}) + \beta_4(Tax_{it}) + \beta_5(Liq_{it}) + \beta_6(Div_{it}) + \beta_7(R\&D_{it}) + \beta_8(Fin\_needs_{it}) + \beta_9(Quick_{it}) + \beta_{10}(Cash\_flow_{it}) + \mu_{it}$ Where

$User_{it}$ = (|FV of derivatives assets| + |FV of derivatives liabilities|) / (Market Value of the firm) if $User_{it} > 0$; $User_{it} = 0$ otherwise and $\mu_{it} \sim N(0,\sigma^2)$

Tobit analysis modelled derivatives use as the sum of the absolute value of derivatives assets and absolute value of derivatives liabilities outstanding at the balance sheet date, scaled by the market value of the firm.

As discussed in Chapter 4, some of the firms did not use derivatives. Therefore, even though the continuous dependent variable to measure derivatives use is not technically a censored variable, its distribution shares a key characteristic with a censored variable (some observations at 0 for firms which do not use derivatives). The use of a Tobit model is therefore appropriate. Therefore using the estimation process explained in section 5.3.2 panel Tobit with random effects selected as the best model. Further (here and throughout the chapter) standard errors were clustered at the firm level.

Table 5.11 shows the results of Tobit regression using total fair values of derivatives as the dependent variable. Furthermore, year dummies and industry dummies have been used to examine their joint significance; in each case, they were found to be jointly significant, therefore retained in the model.

Table 5.11
Tobit regression results - determinants of corporate use of derivatives

Independent Variables	Predicted sign	Coefficient estimate	Std. Err	t value	P-value
Financial distress hypothesis					
Leverage	+	0.0178***	0.0051	3.50	0.000
Tax benefit hypothesis					
Tax	+	0.0043***	0.0018	2.41	0.008
Under investment hypothesis					
Quick	-	0.0037***	0.0006	6.64	0.000
Fin needs	+	-0.0009	0.0181	-0.05	0.480
Cash flow volatility					
Cash flow	-	0.0021	0.0193	0.11	0.457
Firm size					
Size	+	0.0002	0.0009	0.24	0.405
Alternative hedging instruments					
Liq	-	-0.0020	0.0017	-1.16	0.123
Div	+	0.0008	0.0021	0.36	0.358
Year					
2006		-0.0001	0.0018	-0.05	0.479
2007		0.0023	0.0018*	1.29	0.098
2008		0.0135	0.0018***	7.61	0.000
2009		0.0061	0.0018***	3.38	0.000
2010		0.0043	0.0018***	2.37	0.009
2011		0.0030	0.0018**	1.65	0.049
2012		0.0008	0.0018	0.45	0.325
Constant		0.0017	0.0138	0.12	0.450
Industry type					
Consumer Goods		-0.0056	0.0061	-0.90	0.183
Consumer Services		-0.0074	0.0052*	-1.41	0.079
Healthcare		-0.0134	0.0076**	-1.75	0.039
Industrials		-0.0040	0.0051	-0.78	0.217
Oil & Gas		0.0068	0.0067	1.02	0.152
Technology		-0.0085	0.0075	-1.13	0.129
Telecommunications		-0.0063	0.0096	-0.66	0.256
Utilities		0.0407	0.0090	4.55	0.000

Log likelihood	: 3729.7977	Number of obs	: 1458
Rho	: 0.6182	Group variable	: Firm
Prob > chi2	: 0.0000	Number of groups	: 218

Table 5.11 reports the results of determinants of derivatives use obtained from Tobit model with year and industry dummies. Total fair value of derivative assets and absolute value of derivatives liabilities, scaled by the total of assets and absolute value of liabilities of the derivatives users as is the dependent variable. Firm size is defined as the log of the total assets where total

assets represent the sum of total current assets, long term receivables, investment in unconsolidated subsidiaries, other investments, net property plant and equipment and other assets. Leverage is defined as the total debt divided by total assets. Tax equals 1 if firms have carry forward losses, zero otherwise. Liquidity is given by the log of current assets minus inventory over current liabilities. Dividend pay-out is determined by a dummy with a value of 1 if dividends per share are positive, zero otherwise. Quick ratio is measured by the total of cash & equivalents and net receivables over current liabilities. Financing needs were examined using the difference between capital expenditures and net cash flows from operating activities over total assets. Cash flow volatility is measured using net cash flows from operating activities over total assets. The p-value is based on a one-tailed test. Significance levels at 1%, 5% and 10% are indicated with ***, **, * respectively

Results indicate that leverage and tax are the primary significant independent variables that explain derivatives use. In addition, both variables have the sign expected by the theory, indicating that derivatives use is positively associated with leverage and tax losses carried forward. Berkman *et al.* (2002), found that leverage and size are the only important factors in determining derivatives use.

They suggested that their weak results might be due to voluntary financial instrument disclosures in Australia; which ultimately might have increased the number of non-users. In the UK (chapter 4), the proportion of derivative users is much higher than in Australia, and also the reporting of derivatives fair values is mandatory; hence results here are less impacted by noise (i.e. non-disclosed derivatives). My Tobit analysis suggests that, amongst the posited factors in the model only, tax losses carried forward are the only significant factors in determining the firms' decision to use derivatives in the UK. However, unlike in other studies, Table 5.11 shows a weak significance level for coefficient of size variable. This may mainly due to the sample selection process; the majority of other similar studies chose firms based on factors such as industry, country, whereas this study selected firms based on firm size and is therefore likely to have less variability between firms. It is also important to note that most previous studies did not include a rich dataset with 1834 firm years as I have done in this study. Nevertheless, the current results are consistent with previous studies showing firm size is positively associated with fair values of derivatives use.

In addition, it shows that derivatives use significantly changed during the latter part of the 2007/2008 - at the time of and in the aftermath of the global financial crisis – a time of increased volatility across a range of financial and commodity markets. In 2008, 2009 and 2010 this change is significant at 1% level of significance. On the other hand, this indirectly suggests that firms did not or could not change their risk management strategies until the end of the financial crisis. With regards to industries, derivatives use in consumer services and health care industries was lower, significant at the 5% level of significance; while derivatives use in utility firms was higher, significant at 1%.

Similar to the logit analysis in section 5.3.3, this analysis was repeated excluding financial years 2007 and 2008. Estimated coefficients of leverage showed highly significant results, confirming the financial distress hypothesis while evidence of tax hypothesis was present at 5% level of significance. Additionally, 2009 and 2010 showed significant time effects, suggesting a change to derivatives use patterns. Also, derivatives use appeared to be significantly higher in oil & gas firms, whereas in other industries coefficient estimate was negative.

5.3.5 Multivariate linear regression results - determinants of corporate use of derivatives

In addition to logit and Tobit analysis this study undertook MVLR analysis and carried out a t-test to analyse determinants of derivatives use. Here the dependent variable is defined as follows.

$$y_{iT} = \mu_T + \eta_i + \beta_T x_{iT} + \gamma_{2T} z_i + \varepsilon_{iT}$$

for the T-dimensional vector variable $y_i = (y_{i1}, y_{i2}, \ldots, y_{iT})$. Here y_{it}, x_{it}, z_i and ε_{iT} are; *i* = 1,…., *N* indexes individuals (units) and *t* = 1, …. , *T* indexes time points. The scalar y_{it} and the vectors x_{it} are, respectively, the values of the dependent variable *Y* and (time-dependent and time-independent, respectively) covariates x = $(x_1, \ldots, x_k)$ and z = $(Z_1, \ldots, Z_q)$ for unit *i* at time *t*. ε_{it} is the error term.

By following the steps explained in section 5.3.2 the RE model with year and industry dummies has been selected as the best model. Table 5.12 shows the results of multivariate regression analysis.

Table 5.12
Multivariate regression results - determinants of corporate use of derivatives

Independent Variables	Predicted sign	Coefficient estimate	Std. Err	t value	P-value
Financial distress hypothesis					
Leverage	+	0.0253***	0.0058	4.33	0.000
Tax benefit hypothesis					
Tax	+	0.0042***	0.0018	2.35	0.009
Under investment hypothesis					
Quick	-	-0.0001	0.0017	-0.03	0.487
Fin_needs	+	-0.0021	0.0204	-0.10	0.458
Cash flow volatility					
Cash_flow	-	-0.0084	0.0219	-0.38	0.351
Firm size					
Size	+	-0.0056***	0.0018	-3.17	0.001
Alternative hedging instruments					
Liq	-	0.0021	0.0026	0.83	0.203
Div	+	0.0026	0.0023	1.12	0.130
2006		0.0001	0.0018	0.05	0.480
2007		0.0034**	0.0018	1.87	0.030
2008		0.0155***	0.0019	8.20	0.000
2009		0.0086***	0.0019	4.48	0.000
2010		0.0073***	0.0020	3.71	0.000
2011		0.0065***	0.0020	3.22	0.001
2012		0.0044**	0.0021	2.13	0.017
Constant		0.0828***	0.0248	3.34	0.001
Log likelihood : 3729.7977			Number of obs : 1458		
F (217,1225) : 13.52			Group variable : Firm		
Prob > F : 0.0000			Number of groups : 218		

In table 5.12 the dependent variable is the total fair value of derivative assets and absolute value of derivatives liabilities, scaled by the total of assets and absolute value of liabilities of the derivatives users. Firm size is defined as the log of the total assets where total assets represent the sum of total current assets, long term receivables, investment in unconsolidated subsidiaries, other investments, net property plant and equipment and other assets. Leverage is defined as the total debt divided by total assets. Tax equals 1 if firms have carry forward losses, zero otherwise. Liquidity is given by the log of current assets minus inventory over current liabilities. Dividend pay-out is determined by a dummy with a value of 1 if dividends per share are positive, zero otherwise. Quick ratio is measured by the total of cash & equivalents and net receivables over current liabilities. Financing needs were examined using the difference between capital expenditures and net cash flows from operating activities over total assets. Cash flow volatility is measured using net cash flows from operating activities over total assets. Based on one-tailed test significance levels at 1%, 5% and 10% were indicated with ***, **, * respectively.

Similar to the results from the Tobit regression analysis, leverage and tax variables showed a significant positive relationship. Furthermore, time effects for years 2008 – 2011 were significant at 1%, while 2007 and 2012 were significant at the 5% level of significance. The main difference between the results presented in table 5.12 and the results from the Tobit model (table 5.11) is that here firm size, a proxy for economies of scale (significant at 1% level and carries the expected positive sign), is no longer statistically significant. In addition, there are notable differences between the Tobit results and MVLR with regards to dummy year variables; the Tobit coefficient of 2011 dummy year was significant at 5% while in MVLR it was 1%; also, the coefficient of 2012 dummy year was not significant in Tobit whereas in MVLR it was significant at 5%.

Additionally, MVLR was carried out excluding data from financial years 2007 and 2008. The results support the financial distress hypothesis with leverage as highly statistically significant at 1% level of significance. Furthermore, coefficient estimate of the tax variable were significant at 5%, again supporting the argument that UK non-financial firms use derivatives to reduce the burden of taxes. Similar to results from the Tobit analysis, the quick ratio coefficient was highly significant at 1% with the expected sign. Furthermore, MVLR model results, without data from financial years 2007 and 2008 showed that in 2009 and 2010 derivatives use was significantly higher at 1% level of significance. However, in 2011 this was significant at 5% level of significance.

A comparison of the current findings with the literature suggests that derivatives use results are not only country dependent but also depend on the study sample and time period[36].

---

[36] Additionally, determinants of derivatives use regressions with lagged cash flow volatility (CFV) variable were run. There wasn't any difference to CFV coefficients arising from the decision to use derivatives. However, it reduced the significance of other variables (Most probably due to reducing the sample size). Also, Nance *et al.* (1993) found no significant difference in the volatility of pretax income between derivative users and non-users with lagged data; possibly differences in volatility of cash flows was reduced by hedging. Also, MacKay and Moeller (2007) and Frestad (2010) argued that there is a trade-off between the value of lowering cash flow volatility and the hedging based on the tax hypothesis by Smith and Stulz (1985).

5.3.6 Summary

The Following table summarises the findings of determinants of decision to use derivatives and what drives derivatives usage.

Table 5.13
Summary - Multivariate analysis

Variable	**Predicted sign**	**As predicted and significant?**		
		Logit	**Tobit**	**Basic MVLR**
Leverage	+	yes	yes	yes
Tax	+	no	yes	yes
Quick	-	yes	no	no
Fin needs	+	no	no	no
Cash flow	-	no	no	no
Size	+	yes	no	no
Liquidity	-	no	no	no
Dividend	+	no	no	no

5.3.7 Hedge accounting use

This section will focus on the decision to adopt hedge accounting. In previous sections I looked at the considerations for derivatives use, and here the focus is on considerations of adoption of hedge accounting. The former is about the economic reality of whether or not the firm has derivative contracts; the second is about how those contracts, if there are any, are accounted for. Further it is important to note the decision to use hedge accounting is a decision only relevant for those who definitely have derivatives. Disclosures about hedging essentially turn private information into publicly available information (Panaretou *et al.*, 2013). With the introduction of IAS 32, 39 and IFRS 7 financial statements users are able to gather hedge accounting usage data from annual reports. Despite this, there is very little empirical evidence on how hedge accounting rules influence firms' risk management practices (Glaum and Klöcker, 2011).

Similar to determinants of derivatives use literature, studies examining hedge accounting practices have mostly used survey data or an indicator variable to investigate the causes of hedge accounting. However, in the current study, in order to examine the determinants of hedge accounting use, hedging fair value data was manually collected from FTSE 350 annual reports published from 2005 to 2012.

The dependent variables are a selection of proxy measures for tax, expected costs of financial distress, underinvestment costs, cash flow volatility, economies of scale and hedging substitutes hypotheses. Independent variable data were taken from the DataStream database. Table 5.14 provides summary statistics for explanatory variables with the expected sign predicted by literature. Results show that except for quick ratio and financing needs, all other variables had the expected sign.

Table 5.14

Descriptive statistics of independent variables - users of hedge accounting

Variable	Predicted Sign	Mean	Std. Dev	Min	Max
Financial distress hypothesis					
Leverage	+	0.245	0.172	0.000	1.345
Tax benefit hypothesis					
Tax	+	0.095	0.294	0.000	1.000
Under investment cost / external financing hypothesis					
Quick ratio	-	1.000	1.493	0.000	9.373
Financing needs	+	-0.061	0.085	-2.293	0.654
Cash flow volatility					
Cash flow volatility	+	0.111	0.082	-0.291	2.340
Firm Size					
Firm size	+	14.440	1.582	9.340	19.206
Alternative hedging instruments					
Liquidity	-	-0.126	0.602	-3.340	3.912
Dividend pay out	+	0.889	0.314	0.000	1.000

Table 5.14 reports the descriptive statistics of independent variables used in the analysis. There are 1437 observations spread over years 2005 to 2012. The size of the firm is defined as the log of the total assets where total assets represent the sum of total current assets, long term receivables, investment in unconsolidated subsidiaries, other investments, net property plant and equipment and other assets. Leverage is defined as the total debt divided by total assets. Tax equals 1 if firms have carry forward losses, zero otherwise. Liquidity is given by the log of current assets minus inventory over current liabilities. Dividend is determined by a dummy with a value of 1 if dividends per share are positive, zero otherwise. Quick ratio is measured by the total of cash & equivalents and net receivables over current liabilities. Financing needs were examined using the difference between capital expenditures and net cash flows from operating activities over total assets. Cash flow volatility is measured using net cash flows from operating activities over total assets.

5.3.7.1 Determinants of Hedge accounting use - Univariate Analysis

Table 5.15
Univariate nonparametric tests – hedge accounting use

	Firms did not use hedge accounting Firm years = 210		Firms used hedge accounting Firm years = 1227			
Variable	**Mean**	**Median**	**Mean**	**Median**	**Z-statisti**	**P-value**
Financial distress hypothesis						
Leverage	0.196	0.154	0.254	0.238	-5.608	0.000***
Tax benefit hypothesis						
Tax	0.181	0.000	0.807	0.000	4.570	0.000***
Under investment cost / external financing hypothesis						
Quick ratio	1.426	1.060	0.929	0.812	6.542	0.000***
Financing needs	-0.046	-0.057	-0.064	-0.053	1.185	0.236
Cash flow volatility						
Cash flow volatility	0.101	0.099	0.113	0.097	-1.183	0.237
Firm Size						
Firm size	13.476	13.475	14.605	14.453	-9.488	0.000***
Alternative hedging instruments						
Liquidity	0.151	0.167	-0.174	-0.130	6.674	0.000***
Dividend pay out	0.717	1.000	0.918	1.000	-8.482	0.000***

In the table 5.15 hedge accounting users are the firms that reported interest rate swaps, cross currency swaps, forwards, commodity derivatives or any other form of derivative fair values at the end of the financial years 2005 to 2012. Non-hedge accounting users are the firms which did not report any of the above derivative categories at the respective balance sheet dates in any of the three hedging categories (ie. FV, CF or NI hedge). Firm size is defined as the log of the total assets where total assets represent the sum of total current assets, long term receivables, investment in unconsolidated subsidiaries, other investments, net property plant and equipment and other assets. Leverage is defined as the total debt divided by total assets. Tax equals 1 if firms have carry forward losses, zero otherwise. Liquidity is given by the log of current assets minus inventory over current liabilities. Dividend pay-out is determined by a dummy with a value of 1 if dividends per share are positive zero otherwise. Quick ratio is measured by the total of cash & equivalents and net receivables over current liabilities. Financing needs were examined using the difference between capital expenditures and net cash flows from operating activities over total assets. Cash flow volatility is measured using net cash flows from operating activities over total assets. The Z-statistics in the table 5.15 are based on the Two-sample Wilcoxon rank-sum (Mann-Whitney) test, which examines the differences in the medians between hedge accounting user firms and firms not using hedge accounting.

Hedging with derivatives could reduce the firm's risk exposure and produce an economically desirable outcome. In contrast, reporting derivatives using fair value accounting as mandated by IFRS may result in additional earnings or cash flow volatility on the financial statements (Bartram *et al*., 2006), so potentially failing to achieve the objectives they were designed for (Stulz, 2013). Examining the differences between fair value accounting users and non-users could therefore provide valuable insights into derivatives use. This section will attempt to achieve this objective using Univariate Nonparametric analysis.

Table 5.15 data shows that during the study period amongst derivative users 210 firm years did not have any hedge accounting fair values while 1227 firm years did. As explained in the literature review, financial distress theory is one of the main reasons for using derivatives; derivatives users should therefore have a higher debt to asset ratio. For hedge accounting users, the mean leverage was significantly higher at the 0.01 level of significance. Similarly, the current study used the tax argument to assess whether tax is a determinant factor for using hedge accounting. The study examined whether greater tax loss carry forwards can be seen amongst hedge accounting users. Table 5.9 results show that only 14.1% of the firms carried forward tax losses amongst firms that did not use hedge accounting. However, this figure is significantly greater at the 0.01 level of significance with 80.7% hedge accounting user firms carrying forward tax losses during the study period. Likewise, 91.8% of the hedge accounting users declared dividends from 2005 to 2012; though this is significantly lower at 1% level of significance for non-hedge accounting user firms. Consistent with the theoretical predictions, both liquidity and quick ratio were significantly smaller at 1% level of significance for hedge accounting users. In addition, hedge accounting user firms had a significantly higher mean firm size indicating that the economies of scale argument and knowledge about hedge accounting are influential factors in determining the hedge accounting use.

Nevertheless, the results for cash flow volatility were contrary to predictions. Hedge accounting users tend to invest less on research and development; they also had a smaller mean cash flow volatility. Both were significant at 1%. On the other hand, as data used in the study runs from 2005 to 2012, one can argue that the reason for this smaller mean cash flow volatility is that hedge accounting use itself reduced the cash flow volatility. Finally, financing needs of users appears to be slightly larger than for non-users, but the difference is insignificant.

Table 5.16

Pearson correlation matrix - independent variables of hedge accounting use

Variable	Size	Leverage	Tax	Liq	Div	Quick	Fin needs	Cash flow
Size	1.0000							
Leverage	0.2059*	1.0000						
Tax	-0.0307	0.0960*	1.0000					
Liq	-0.2685*	-0.2321*	-0.0106	1.0000				
Div	0.1199*	0.0072	-0.3418*	-0.0663*	1.0000			
Quick	-0.2591*	-0.2340*	0.0226	0.8304*	-0.1376*	1.0000		
Fin needs	0.1534*	0.2253*	0.2225*	-0.0952*	-0.1801*	-0.0042	1.0000	
Cash flow	-0.1617*	-0.1723*	-0.2089*	0.1123*	0.0966*	0.0435	-0.8615*	1.0000

Table 5.16 shows the Pearson correlation matrix for independent variables of hedge accounting use. Size is the log of the total assets where total assets represent the sum of total current assets, long term receivables, investment in unconsolidated subsidiaries, other investments, net property plant and equipment and other assets. Leverage is the total debt divided by total assets. Tax is an indicator variable which takes the value of 1 if firms have carry forward losses, zero otherwise. Liq is given by the log of current assets minus inventory over current liabilities. Div is a dummy variable with a value of 1 if dividends per share are positive, zero otherwise. Quick is the total of cash & equivalents and net receivables over current liabilities. Fin needs were examined using the difference between capital expenditures and net cash flows from operating activities over total assets. Cash flow is net cash flows from operating activities over total assets. A star next to the correlation score indicates that the result is statistically significant at 5% level with P value in the next row. The third row displays the number of observations.

Pearson correlation matrix is used to investigate the dependence between independent variables used in the determinants of the hedge accounting use study. This shows the correlation coefficients and their significance between each variable and the others. Data shows that there is a significant positive association between quick ratio and liquidity; similarly, a significant negative association between cash flow volatility and financing needs. The remaining correlation coefficients stayed within an acceptable level.

5.3.7.2 Determinants of hedge accounting use - logit regression results

Over the last two decades, standard setters have gradually implemented fair value accounting across derivatives financial instruments as they believe fair value accounting provides the most relevant information for investors to make informed decisions (Ahmed, Kilic and Lobo, 2011). Conversely, fair value accounting has been criticised for causing the 2007/2008 financial crisis (Laux and Leuz, 2009; Dontoh *et al*., 2012). Regardless, there has been little empirical evidence on fair value accounting at firm level, especially amongst UK firms. Using panel logistic analysis, section 5.2.2.2 examines how hedging fundamentals influence hedge accounting use.

Table 5.17

Logit regression results - determinants of decision to use hedge accounting

Independent Variables	Predicted sign	Coefficient estimate	Std. Err	Z-value	P-value
Financial distress hypothesis					
Leverage	+	3.9931	1.8225	2.19	0.014**
Tax benefit hypothesis					
Tax	+	0.3625	0.5608	0.65	0.259
Under investment hypothesis					
Quick	-	1.0109	0.8146	1.24	0.107
Fin_needs	+	6.8055	6.0111	1.13	0.129
Cash flow volatility					
Cash_flow	+	12.7507	6.5556	1.95	0.026**
Firm size					
Size	+	3.3587	0.6258	5.37	0.000***
Alternative hedging instruments					
Liq	-	-0.0616	0.9888	-0.06	0.475
Div	+	-0.2175	0.6283	-0.35	0.364
Log likelihood : -79.5239			Number of obs : 1419		
LR chi2(8) : 57.98			Group variable : Firm		
Prob > chi2 : 0.0000			Number of groups : 213		

Table 5.17 reports the results of determinants of hedge accounting use amongst FTSE 350 derivatives users obtained using the logit model. Results are based on 1419 observations from 2005 - 2012. The hedge accounting use dependent variable is set to 1 if firms accounted for any type of derivatives as a fair value hedge, cash flow hedge or net investment hedge; otherwise 0. Firm size is defined as the log of the total assets where total assets represent the sum of total current assets, long term receivables, investment in unconsolidated subsidiaries, other investments, net property plant and equipment and other assets. Leverage is defined as the total debt divided by total assets. Tax equals 1 if firms have carry forward losses, zero otherwise. Liquidity is given by the log of current assets minus inventory over current liabilities. Dividend pay-out is determined by a dummy with a value of 1 if dividends per share are positive, zero otherwise. Quick ratio is measured by the total of cash & equivalents and net receivables over current liabilities. Financing needs were examined using the difference between capital expenditures and net cash flows from operating activities over total assets. Cash flow volatility is measured using net cash flows from operating activities over total assets. Significance levels at 1%, 5% and 10% are indicated with ***, **, * respectively.

Under the IFRS accounting regime derivatives should be measured at their fair value and must be recognised as an asset or a liability on the balance sheet. In logit analysis, the dependent variable is set to 1 if firms reported any type of derivatives as a fair value hedge, cash flow hedge or net investment hedge, zero otherwise. By doing so the study directly examines managers' decision to use hedge accounting at the individual firm level.

Table 5.17 results indicate that firm size significantly influences the decision of firms to use hedge accounting. This suggests that economies of scale are a significant factor when firms consider using hedge accounting to report derivatives transactions. In addition, as suggested by Berkman & Bradbury (1996) and Nguyen & Faff (2002), this may be due to the high start-up cost involved in setting up a risk management programme and/or lack of knowledge and skills required for implementation as well as maintaining hedge accounting treatment on derivatives disclosure and reporting.

Another important and influential factor in using hedge accounting for reporting derivative fair values is the leverage level of the firm. Empirical studies suggest that one of the most important economic reasons for using derivatives is to minimise the expected costs of financial distress (Guay 1999; Borokhovich *et al*., 2004; Bartram *et al*., 2009). This study proxied the financial distress hypothesis with leverage; The results of table 5.15 suggest that firms with higher expected cost of financial distressed are likely to use hedge accounting. One possible explanation for this significantly positive relationship is that the benefits of hedging on the performance of financially distressed firms may be visible to investors, creditors and third parties only via financial statements, therefore managers are encouraged to apply hedge accounting. This argument is further supported by the significantly positive relationship between cash flow volatility and the decision to use derivatives.

The above analysis was extended to investigate the outcome when the 2007/2008 financial crisis period was excluded. The results show no change to the determinants behind the use of hedge accounting to report derivatives positions, except leverage is highly significant at 1% compared to the previous 5% level of significance.

Further comparison of the decision to use derivatives results with the decision to use hedge accounting shows that financial distressed firms are likely to use hedge accounting to report derivatives transactions. On the other hand, as none of the other proxies was significant, it suggests that hedge accounting rules did not influence firms' decision to use derivatives. Thus, these findings provide a unique contribution to the existing literature by advancing our understanding of the factors associated with the decision to use hedge accounting and their impact on risk management.

Consistent with Glaum and Klöcker (2011), this further suggests that larger firms that regularly use derivatives for their risk management have developed systems and procedures that facilitate the application of hedge accounting without compromising their hedging strategies. On the other hand, financially distressed FTSE 350 firms are constantly followed and monitored by regulators, stakeholders, investors and analysts, They are therefore likely to use hedge accounting to highlight efforts put in by the management towards effective risk management.

Section 5.2.2.2 focused on the factors behind firms' decision to apply hedge accounting. Section 5.2.2.3 will investigate the factors influence the use of hedge accounting, using fair value as a measure of hedging activity. This will further help to understand the economic significance of hedge accounting.

5.3.7.3 Determinants of hedge accounting use – Tobit analysis

This section examines the application of hedge accounting and its influence on derivatives use amongst FTSE 350 non-financial firms. Table 5.18 below shows the results of Tobit regression. It also shows the year-on-year differences in hedge accounting use.

Table 5.18 results indicate that leverage and tax variables are significant at the 1% significance level with the expected sign, denoting financially distressed firms are likely to use hedge accounting to report their derivatives positions as well as using the tax system for their benefit using derivatives. In addition, quick ratio is significant at 5% level of significance, supporting the underinvestment hypothesis. Comiskey and Mulford (2009) argued that due to the very detailed nature of hedge accounting, it made itself too complex and hence was an additional burden for firms. Therefore, the expectation was that the hedge accounting determinants would be different to derivatives use determinants.

Table 5.18
Tobit regression results - determinants of hedge accounting

Independent Variables	Predicted sign	Coefficient estimate	Std. Err	t value	P-value
Financial distress hypothesis					
Leverage	+	0.0208	0.0051	4.12	0.000***
Tax benefit hypothesis					
Tax	+	0.0043	0.0017	2.54	0.005***
Under investment hypothesis					
Quick	-	-0.0028	0.0015	-1.83	0.033**
Fin_needs	+	0.0098	0.0180	0.54	0.293
Cash flow volatility					
Cash_flow	+	0.0078	0.0190	0.41	0.340
Firm size					
Size	+	-1.06e-06	0.0009	-0.00	0.499
Alternative hedging instruments					
Liq	-	0.0078	0.0022	3.61	0.000
Div	+	0.0006	0.0021	0.28	0.388
2006		-0.0010	0.0017	-0.60	0.273
2007		0.0019	0.0017	1.13	0.128
2008		0.0120	0.0017	6.96	0.000
2009		0.0055	0.0018	3.12	0.001
2010		0.0042	0.0018	2.36	0.009
2011		0.0033	0.0018	1.86	0.031
2012		0.0010	0.0018	0.55	0.290
Industry type					
Consumer Goods		-0.0048	0.0066	-0.72	0.236
Consumer Services		-0.0045	0.0056	-0.81	0.209
Healthcare		-0.0154	0.0081	-1.90	0.028
Industrials		-0.0057	0.0055	-1.04	0.150
Oil & Gas		0.0031	0.0072	0.43	0.334
Technology		-0.0096	0.0080	-1.21	0.113
Telecommunications		-0.0076	0.0101	-0.75	0.226
Utilities		0.0266	0.0101	2.64	0.004
Constant		0.0128	0.0146	0.87	0.191

Log likelihood	: 3673.0337	Number of obs	: 1419
Rho	: .663477	Group variable	: Firm
Prob > chi2	: 0.0000	Number of groups	: 213

Table 5.18 reports the results of determinants of derivatives use obtained from the Tobit model with year and industry dummies. Total fair value of derivative assets and absolute value of derivatives liabilities, scaled by the total of assets and absolute value

of liabilities of the derivatives used as dependent variable. Firm size is defined as the log of the total assets where total assets represent the sum of total current assets, long term receivables, investment in unconsolidated subsidiaries, other investments, net property plant and equipment and other assets. Leverage is defined as the total debt divided by total assets. Tax equals 1 if firms have carry forward losses, zero otherwise. Liquidity is given by the log of current assets minus inventory over current liabilities. Dividend pay-out is determined by a dummy with a value of 1 if dividends per share are positive, zero otherwise. Quick ratio is measured by the total of cash & equivalents and net receivables over current liabilities. Financing needs were examined using the difference between capital expenditures and net cash flows from operating activities over total assets. Cash flow volatility is measured using net cash flows from operating activities over total assets. The p-value is based on a one-tailed test.

The above results show that financially distressed firms are in fact keen on using hedge accounting to report their derivatives positions irrespective of the complexity of hedge accounting. Furthermore, Comiskey and Mulford (2009) argued that hedge accounting was itself likely to contribute to an increase in earnings volatility. Therefore, the expectation was that cash flow volatility would be a determinant factor in using hedge accounting. However, the above results suggest otherwise, leading to the conclusion that the effect of hedge accounting on cash flow volatility is minimal

Furthermore, year dummies were used to determine whether there were significant differences in hedge accounting use over the study period. Table 5.18 results show that derivatives use during the latter part of the financial crisis through to year 2010 is significantly different (at 1% level of significance) to other years. Some suggest that fair value and hedge accounting contributed to, or maybe even caused, the financial crisis (Wallace 2008; Schmidt, 2009). However, the above results do not provide any evidence to support this argument in a UK context. Additionally, the above results suggest that derivatives use in the healthcare and utility sectors was different to other sectors during the study period.

Also, results obtained after excluding 2007 and 2008 data support the financial distress hypothesis (i.e. the minimal influence of the global financial crisis on the usage of hedge accounting to report derivatives amongst financially distressed firms). Additionally, coefficients of tax, quick ratio and cash flow volatility variables were significant at 5% level of significance with expected sign, supporting the argument that traditional determinants of derivatives use are valid for hedge accounting use too.

5.3.7.4 Determinants of hedging categories – logit analysis

Current accounting standards requires firms to report derivatives at their fair value at each balance sheet date; subsequent changes to their fair values are recorded in either the income statement or in the other comprehensive income statement. In addition, for a derivative to be reported under hedge accounting, at the inception of the hedge, firm must identify the nature of the hedge, the hedging and hedged items, and the hedge term, and whether the derivatives are designated for accounting purposes as a fair value hedge, cash flow hedge or net investment hedge and the method for assessing the hedge effectiveness. Further, throughout the hedge, the firm must evaluate the effectiveness of the hedge and the ineffective portion must be recorded in the income statement. Regardless of the outcome of the hedge, the firm must maintain the original hedging category that it decided on at the beginning. Therefore, investigating firm-specific factors and the characteristics that influence the firm's decision to select specific hedging categories is important.

Table 5.18 shows the results from pooled logit on the decision to use fair value hedges, cash flow hedges and net investment hedges; reported separately in models 1 to 3 respectively. The decision to use fair value hedges showed a positive significant relationship with firm size, supporting the economies of scale argument. With respect to IFRS definitions, this leads to the conclusion that larger firms are not only likely to use FV hedges, also these firms were concerned about hedging of exposure to fair value variability in an asset, liability or unrecognised firm commitment which was attributable to a risk that could affect their profitability.

Table 5.19 results also suggest that cash flow hedges and net investment hedges are being used to reduce underinvestment costs and also show that use of derivatives designated as net investment hedges are significantly negatively associated with cash flow volatility, a finding that is consistent with hedge accounting treatments. In addition, the results document a significant positive association between cash flow volatility and the decision to designate derivatives as cash flow hedges, showing the need on cash flow hedges towards cash flow volatility management.

Table 5.19
Logit regression results - determinants of decision to use different hedging categories

Independent Variables	Predicted sign	Model 5.1 Fair value hedge	Model 5.2 Cash flow hedge	Model 5.3 Net investment hedge
Financial distress hypothesis				
Leverage	+	3.680**	2.025**	3.279***
		(1.83)	(1.44)	(2.33)
Tax benefit hypothesis				
Tax	+	1.070	-0.244	0.626
		(1.59)	(-0.52)	(1.22)
Under investment hypothesis				
Quick	-	0.574	1.452**	-0.031
		(0.61)	(2.02)	(-0.05)
Fin needs	+	0.838	5.672	-15.478**
		(0.10)	(1.12)	(-2.22)
Cash flow volatility				
Cash flow	+	-8.823	10.979**	-13.728**
		(-0.96)	(2.00)	(-1.91)
Firm size				
Size	+	1.164**	2.597***	0.806***
		(2.04)	(5.60)	(3.37)
Alternative hedging instruments				
Liq	-	0.138	-1.490**	-0.057
		(0.15)	(1.85)	(-0.08)
Div	+	-0.206	-0.081	0.764
		(-0.27)	(-0.15)	(0.99)
Number of observations		1419	1419	1419
Log likelihood		-117.7682	-137.3428	-344.8918
LR chi2(8)		27.46	53.09	22.66
Prob > chi2		0.0006	0.0000	0.0038

Table 5.19 model 5.1 reports the results of determinants of fair value hedge use amongst FTSE 350 derivatives users obtained from pooled logit regression, model 5.2 shows the results of the cash flow hedge use and model 5.3 shows the net investment hedge use. Total observations under investigation were 1419 firm years. In model 5.1, model 5.2 and model 5.3 the dependent variable is an indicator variable representing the fair value hedge use, cash flow hedge use and net investment hedge use respectively. Firm size is defined as the log of the total assets where total assets represent the sum of total current assets, long term receivables, investment in unconsolidated subsidiaries, other investments, net property plant and equipment and other assets. Leverage is defined as the total debt divided by inventory over current liabilities. Dividend pay-out is included using a dummy variable with a value of 1 if dividends per share are positive, zero otherwise. Quick ratio is measured by the total of cash & equivalents and net receivables over current liabilities. Financing needs were examined using the difference between capital expenditures and net cash flows from operating activities over total assets. Cash flow volatility is measured using net cash flows from operating activities over total assets. In all three models, significance levels at 1%, 5% and 10% were indicated with ***, **, * respectively.

IFRS 9 requires firms to use cash flow hedges if the hedge is to mitigate the exposure to cash flow variability in cash attributable to a particular risk associated with an asset, liability, or highly probable forecast transaction. Moreover, the model 5.2 findings, coupled with significantly positive leverage and firm size, provide strong support for the view that financially distressed larger firms are likely to use CF hedges. Similar to FV and CF hedges, the model 5.3 findings show that firm size is a determinant factor for use of net investment hedges with 1% level of significance. If a firm has an interest in an asset which involves a foreign operation, at an elementary level it should have an exposure to exchange rate risk due to its regular business activities. As far as NI hedge is concerned, model 5.3 reflects the apparent importance of reducing cash flow volatility arising from foreign operations. In addition, the findings indicate that use of NI hedges is higher amongst underinvested financially distressed FTSE 350 firms. Furthermore, excluding years 2007 and 2008 from the data-set made no noticeable difference to the determinants of decisions to use FV hedges and NI hedges. However, in the CF hedges the significance of quick ratio and liquidity faded away, suggesting a weaker association of the underinvestment hypothesis and alternative hedging instruments on cash flow hedge use.

One of the main contributions of section 5.2.2.4 is to highlight the use of hedge accounting for managing risk using derivatives. The results not only showed the effects of derivative use on UK non-financial firms, but also found the types of hedging categories that firms used to minimise the risk, especially when the world was in financial turmoil.

5.3.8 Determinants of Fair value through profit and loss use

This section focuses on consideration for disclosing fair values through profit and loss statement. In other words here my focus is on firms do use derivative, but do not use hedge accounting. If a derivative is not designated for hedge accounting, it is carried on the balance sheet at its fair value, which is calculated based on the IFRS fair value hierarchy and recorded as fair value through profit and loss derivatives. Further, any subsequent gains or losses related to the changes in the fair value of these derivatives must be included in the income statement as it happens. The main purpose of this section is to explore decisions made by firms not to designate derivatives as accounting hedges and leaving them exposed to the full economic risk.

In the above univariate analysis, total firm years were divided into two groups: firms that reported any derivative fair value as FVTPL and those that did not. Further it reports the mean, median, Z statistics and related p value and the number of cases of the control variables for users (867 cases) and non-users (919 cases) of FVTPL.

Table 5.20
Univariate nonparametric tests – fair value through profit and loss

	Firms use FVTPL Firm years = 919		Firms do not use FVTPL Firm years = 518			
Variable	**Mean**	**Median**	**Mean**	**Median**	**Z-value**	**P-value**
Financial distress hypothesis						
Leverage	0.250	0.231	0.236	0.234	-0.999	0.318
Tax benefit hypothesis						
Tax	0.109	0.000	0.071	0.000	-2.316	0.022**
Under investment cost / external financing hypothesis						
Quick ratio	0.998	0.822	0.911	0.829	-1.184	0.236
Financing needs	-0.060	-0.052	-0.064	-0.056	-1.388	0.165
Cash flow volatility						
Cash flow volatility	0.110	0.095	0.113	0.102	1.527	0.127
Firm Size						
Firm size	14.788	14.685	13.823	13.742	-11.158	0.000***
Alternative hedging instruments						
Liquidity	-0.091	-0.106	-0.189	-0.108	-1.625	0.104
Dividend pay out	0.886	1.000	0.896	1.000	0.576	0.565

In table 5.20 FVTPL users are the firms that reported interest rate swaps, cross currency swaps, forwards, commodity derivatives or any other form of derivatives as FVTPL at the end of the financial years from 2005 to 2012. Non FVTPL users are the firms that did not report any of their derivatives as FVTPL. Firm size is defined as the log of the total assets where total assets represent the sum of total current assets, long term receivables, investment in unconsolidated subsidiaries, other investments, net property plant and equipment and other assets. Leverage is defined as the total debt divided by total assets. Tax equals 1 if firms have carry forward losses, zero otherwise. Liquidity is given by the log of current assets minus inventory over current liabilities. Dividend pay-out is determined by a dummy with a value of 1 if dividends per share are positive, zero otherwise. Quick ratio is measured by the total of cash & equivalents and net receivables over current liabilities. Financing needs were examined using the difference between capital expenditures and net cash flows from operating activities over total assets. Cash flow volatility is measured using net cash flows from operating activities over total assets. The Z-statistics in the table 5.20 are based on the two-sample Wilcoxon rank-sum (Mann-Whitney) test, which examines the differences in the medians between hedge accounting user firms and firms that did not use hedge accounting. Significance levels at 1%, 5% and 10% were indicated with ***, **, * respectively.

According to the results above, the mean value of the size variable is (13.48) significantly lower for FVTPL users than non-users (14.79), indicating the resource intensity of hedge accounting. This could also be an indication of the knowledge and experience of application of IFRS on derivatives amongst FTSE 350 non-financial smaller firms. Statistically significant lower mean leverage is a greater relevance for FVTPL users, meaning that less financially distressed firms paid less attention to using hedge accounting. Also, higher mean cash flow volatility in FVTPL users indicates that firms using FVTPL also attach less weight to the aim of reducing cash flow volatility.

The study also found a significant difference with dividend pay-out ratios where 88.6% of the firms declared dividends when firms did not use FVTPL to account for derivatives while this figure was only 81.4% amongst FVTPL users. Furthermore, there was a difference between FVTPL users and non-users with regards to liquidity and financing needs, both at 5% significance level, while quick ratio was significant at 10%. With regards to using FVTPL to account for derivatives, univariate results do not indicate a significant difference between tax benefits and growth opportunities of users and non-users of FVTPL as reflected by their respective variables.

5.3.8.1 Determinants of fair value through profit and loss use - logit analysis

As univariate analysis does not have a mechanism to control for multiple independent variables simultaneously, the next study applied pooled logit regression to test for significant variations in each of the control variables, holding all other attributes constant.

Table 5.21 model 5.4 results show that FVTPL use for derivative reporting is positively associated with firm size. This is consistent with evidence from previous studies that hedging is common practice amongst many larger non-financial firms worldwide and most non-financial firms in fact do not engage in outright speculation (Glaum and Klöcker, 2011). As IFRS require firms to use either hedge accounting or report derivatives as FVTPL, any derivative that do not qualify for strict hedge accounting criteria must be reported as FVTPL derivatives.

Table 5.21
Logit regression results - determinants of decision to use FVTPL

Independent Variables	Coefficient estimate	Model 5.4 Full dataset	t value	Model 5.5 Data excludes 2007/2008
Financial distress hypothesis				
Leverage		2.614*		2.119
Tax benefit hypothesis				
Tax		1.260***		1.290**
Under investment hypothesis				
Quick		0.484		2.312***
Fin_needs		-4.626		-13.654*
Cash flow volatility				
Cash_flow		-6.886		-15.674**
Firm size				
Size		-0.333		-0.587*
Alternative hedging instruments				
Liq		-0.158		-2.006*
Div		0.769*		0.354
	Number of obs	1419		1054
	Group variable	Firm		Firm
	Number of groups	213		210
	Log likelihood	-188.0111		-113.0470
	LR chi2(8)	20.48		25.07
	Prob > chi2	0.0087		0.0015

Table 5.21 reports the results of determinants of FVTPL to account for derivatives using logit regression. Model 5.4 logit results are based on 1419 observations from 2005 to 2012 analysed as panel data. Model 5.5 logit results are based on 1054 observations from 2005 to 2006 and 2009 to 2012 analysed as panel data. The FVTPL use dependent variable is set to 1 if firms use FVTPL to report any type of derivatives; otherwise zero. Firm size is defined as the log of the total assets where total assets represent the sum of total current assets, long term receivables, investment in unconsolidated subsidiaries, other investments, net property plant and equipment and other assets. Leverage is defined as the total debt divided by total assets. Tax equals 1 if firms have carry forward losses, zero otherwise. Liquidity is given by the log of current assets minus inventory over current liabilities. Dividend pay-out is determined by a dummy with a value of 1 if dividends per share are positive, zero otherwise. Quick ratio is measured by the total of cash & equivalents and net receivables over current liabilities. Financing needs were examined using the difference between capital expenditures and net cash flows from operating activities over total assets. Cash flow volatility is measured using net cash flows from operating activities over total assets. Significance levels at 1%, 5% and 10% are indicated with ***, **, * respectively.

In section 5.2.2.2 logit analysis of the determinants of hedge accounting use showed a highly significant (at 1% significance level) relationship between leverage and hedge accounting use. In this section correlation between FVTPL use and leverage is, however, at 5% level of significance. Empirical results suggest that minimising the expected costs of financial distress is one of the main arguments in favour of economic hedging (Berkman and Bradbury, 1996; Graham and Rogers, 2002; Bartram *et al*., 2009). This diminishing significance of the leverage variable confirms that financially distressed firms are likely to apply hedge accounting to demonstrate management performance by highlighting the positive effects of hedging.

The study also considered the possible influence of other means of hedging on FVTPL use as a vehicle for reporting derivatives. Non-significant coefficient of liquidity indicates a low level of association between FVTPL use and the use of alternative hedging instruments. In addition, dividend variable found to be only 5% significant with the expected sign denoting that firms which declared dividends relied on hedge accounting to report their derivatives positions to a certain extent. Also results show that FVTPL users are highly concerned about the impact of tax liability when decision to use FVTPL being made. Finally results suggest that underinvestment cost hypothesis does not hold in the current date-set.

Model 5.5 presents the results excluding the data for year 2007 and 2008. Model 5.5 results show that most proxy variables were significant at 10% level of significance meaning in a world where without the existence of hedge accounting and any financial crises, current study results would have been similar to the results in previous studies. Understanding the effects of unhedged as well as derivatives did not qualify for hedge accounting during the period of financial crisis is important, given the alleged role played by derivatives during the 2007/2008 financial crisis. This thesis is the first to investigate the FVTPL derivatives usage amongst UK non-financial firms, hence providing a foundation for future research.

5.3.8.2 Determinants of FVTPL – Tobit analysis

This section examines the application of hedge accounting and its influence on derivatives use amongst FTSE 350 non-financial firms. Table 5.22 below shows the results of Yobit regression. Also, year and industry dummies were used to examine the year-on year differences in hedge accounting use and differences between industries.

Table 5.22
Tobit regression results - determinants of FVTPL

Independent Variables	Predicted sign	Coefficient estimate	Std. Err	t value	P-value
Financial distress hypothesis					
Leverage	+	0.0246***	0.0063	3.90	0.000
Tax benefit hypothesis					
Tax	+	0.0035	0.0022	1.62	0.106
Under investment hypothesis					
Quick	-	0.0003	0.0019	0.17	0.866
Fin needs	+	-0.0344	0.0245	-1.40	0.160
Cash flow volatility					
Cash flow	+	-0.0352	0.0260	-1.35	0.176
Firm size					
Size	+	-0.0006	0.0011	-0.53	0.596
Alternative hedging instruments					
Liq	-	0.0013	0.0027	0.48	0.633
Div	+	-0.0030	0.0030	-0.98	0.328
2006		-2.04e-06	0.0022	-0.00	0.999
2007		0.0023	0.0022	1.03	0.301
2008		0.0076***	0.0022	3.39	0.001
2009		0.0034	0.0023	1.48	0.140
2010		0.0020	0.0023	0.00	0.368
2011		0.0020	0.0023	0.86	0.388
2012		-0.0013	0.0023	-0.57	0.568
Industry type					
Consumer Goods		-0.0119	0.0077	-1.55	0.122
Consumer Services		-0.0168	0.0065	-2.59	0.010
Healthcare		-0.0178	0.0096	-1.85	0.064
Industrials		-0.0113	0.0064	-1.75	0.080
Oil & Gas		0.0012	0.0079	0.15	0.878
Technology		-0.0168	0.0090	-1.87	0.061
Telecommunications		-0.0116	0.0125	-0.93	0.353
Utilities		0.0164	0.0107	1.52	0.128
Constant		0.0242	0.0175	1.38	0.167

Log likelihood	: 2294.6337	Number of obs	: 902
Rho	: .6753533	Group variable	: Firm
Prob > chi2	: 0.0000	Number of groups	: 172

Table 5.22 results indicate that leverage is significant at the 1% significance level with the expected sign. In previous sections leverage was also shown to be the main driver of derivatives use. On balance, the expectation is that firms use hedges and FVTPL for different purposes, therefore by logic the determinants have to be different. But the results suggest otherwise. Therefore, this leads to the suggestion that derivative positions reported as FVTPL are in fact failed hedge accounting attempts or hedges that did not qualify for strict hedge accounting rules rather than derivatives used for speculative purposes. In addition, year dummies show that only in 2008 were FVTPL positions significantly different to other years.

This evidence gives little weight to support the proposition that fair value and hedge accounting contributed to, or maybe even caused, the financial crisis suggested by some studies (Wallace 2008; Schmidt, 2009). Furthermore, the exclusion of 2007/2008 data from the dataset did not produce different results to the above, suggesting that further studies are needed with derivatives fair value as a measure of derivatives use, especially considering 5.4.3.1 findings with logistics regression.

5.4 Conclusion

This chapter makes a number of contributions to the extant literature by extending our knowledge on corporate derivative use by UK firms. Initially it contributes to the literature by examining the reasons behind firms' engagement in hedging activities. Previous theoretical and empirical studies suggested that hedging is popular amongst larger firms and reduces expected financial distress cost, the expected cost of tax liabilities, underinvestment costs, cash flow volatility and is negatively related with the use of alternative hedging instruments. However, using logit model, the current study showed that decision to manage risk using derivatives is mostly done by larger firms with higher leverage. Moreover, these findings contributed to the existing theoretical argument by providing evidence to support that derivatives use is associated with higher expected costs of financial distress. These findings are particularly relevant to managers, investors or even creditors in their respective information content in terms of providing early warning of potential financial distress. Also, Tobit results with time effect showed that just after the 2007/2008 financial crisis derivatives use significantly changed in 2008 and 2009.

This paper contributes to the literature on fair value accounting in three ways. Firstly, little is known about the use of IFRS hedge accounting to report derivatives, specifically amongst UK non-financial firms. Chapter 5 provided further insights into post IFRS implementation from a UK non-financial firm's perspective which is of great importance to the UK commercial and regulatory environment; thus, this chapter extends prior theoretical knowledge to assess the firm characteristics that determine financial instrument disclosure levels under the IFRS reporting regime for derivative users. In chapter 5, determinants of hedge accounting study revealed that hedge accounting determinants follow a similar pattern to determinants of derivatives use, indicating that firms are moving towards hedge accounting to report their derivatives positions. Secondly, the findings of this chapter emphasise the usefulness of IFRS fair values as a balance sheet measurement, hence making a contribution to the standard setting literature on the choice of measurement basis. Thirdly this chapter contributes to the theoretical literature on fair value accounting as a choice of conceptual framework, as economic analysis has been undertaken to see the measurement usefulness in information perspective.

In summary, the findings indicate that larger financially distressed UK firms used derivatives for their risk management during the study period. Furthermore, during the 2008/2009 post-financial crisis period, how the firms appeared to have use derivatives in managing their risk, and the way they have reported these derivatives positions using hedge accounting was different to the remaining study period. Therefore this chapter has contributed to literature by examining determinants of derivatives use during the 2007/2008 financial crisis.

In Chapter 6, I will look at how derivatives use influence firm value, and Chapter 7 will therefore examine the understanding of derivatives use and the underlying accounting amongst the experts in financial markets, namely financial analysts.

Chapter 6: Derivatives use on firm value - Evidence from UK non-financial firms

6.1 Introduction

The previous chapter discussed the extent of derivatives use and what factors drive derivatives use amongst UK non-financial firms. This chapter will examine how derivatives use influences firm value using FTSE 350 non-financial firm derivatives use data from 2005 to 2012.

Classic Modigliani and Miller (1958) theory suggests that in perfect market conditions capital structure of a firm is irrelevant to the valuation of the firm.

Since their approach was theoretical and they knowingly and explicitly made perfect market assumptions, subsequent studies carried out empirical studies in real market conditions. Allayannis and Weston (2001) conducted one of the early and widely cited studies where they examined the relationship between foreign currency derivatives use and firm value, using a sample of 720 US firms between 1990 and 1995. Their evidence shows a positive relationship between foreign currency derivatives use and firm value.

Contrary to the above findings, using a sample of 413 US non-financial firms, Guay and Kothari (2003) argued that possible value creation by derivatives use is minimal compared with changes in share prices. Using a sample of 119 US oil and gas producers from 1998 to 2001, Jin and Jorion (2006) argued that there is no value relevance in derivatives use. Using US data between 1991 and 2000, Fauver and Naranjo (2010) found a negative relationship between derivatives use and firm value. These mixed empirical findings highlight the importance of investigating the value relevance of derivatives use, especially considering the fact that studies about value relevance of derivatives use amongst UK firms is very rare.

6.2 Hypothesis development

In perfect market conditions corporate hedging may not add value to a firm (Modigliani and Miller, 1958). However in the real world, with the existence of market frictions, hedging may change firm value. Literature has identified several such market imperfections that could influence firm value and also theories attempting to explain how they might influence the relationship between fair value and derivative use. Most of these theories are consistent with existing theories of corporate hedging and shareholder value maximisation.

The hedging theories that highlight costly external financing focus on the volatility of cash flows as the hedging motivation (Guay and Kothari, 2003). If risk management by derivatives produces positive cash flows in periods of economic uncertainty, hedging with derivatives could increase the value of a firm. Furthermore, in a world where external financing carries a higher cost than internal financing, the probability of a firm's need to access external funds will be reduced if hedging reduces the variability of internal funds (Froot *et al.,* 1993); therefore hedging should increase firm value by reducing the underinvestment problem and ensure that there are sufficient internal funds to engage in profitable investments. In addition to the underinvestment cost, theory suggests that risk management can generate value by reducing expected financial distress costs (Smith and Stulz, 1985; Froot *et al.*, 1993; Nance *et al.*, 1993). Reducing the probability of expected financial distress cost could lead to lower contracting costs, ultimately leading to a higher firm value.

With regards to derivatives hedging and the expected tax liability, broadly there are two arguments. First is the tax convexity theory established by Smith and Stulz (1985), which suggests that more convex the effective tax schedule, the more a firm benefits from a reduction in expected taxes. The second argument, proposed by Leland (1988), suggests that hedging could lead to a greater debt capacity, hence increasing firm value by the tax deductibility of interest payments. Furthermore, in the managerial utility maximisation hypothesis, Smith and Stulz (1985) argued that managers who have an interest in their firm's equity have an incentive to hedge while managers option holdings provide less incentive to hedge.

Market imperfections provide the rationale for hedging, hence risk management could increase value by increasing future profitability. However, as discussed in section 6.1, even with the presence of these market imperfections some found that there is no relationship between hedging and firm value. In addition to these mixed results on risk management and firm value, to date how hedging with derivatives influences firm value, especially in UK firms, has been poorly studied and there are no studies investigating how UK firms' value behaved during the full period of the 2007/2008 financial crisis under the IFRS accounting regime. Hence this study will test the following hypothesis.

> ***Hypothesis: There is a positive relationship between firm value and the use of derivatives for hedging amongst UK firms.***

Subsequently this will be extended to instrument level and hedging categories, where the study will examine whether the use of different instruments or of different hedging categories adds value to a firm. Under the derivatives instruments study, how interest rate swaps, cross currency swaps, forwards, commodity derivatives and other derivatives use influence firm value will be investigated. Similarly, the hedging category study will examine how fair value hedges, cash flow hedges and net investment hedges affect the value of a firm.

Next, in section 6.3 methods used in Chapter 6 further discussed. Furthermore, in section 6.4.3.2, prior to present findings model selection process also discussed.

6.3 Data description and firm value

As previously discussed in chapter 3, study data set consists of the FTSE 350 non-financial firms listed on the London Stock Exchange from 2005 to 2012. Independent variables were collected from the Datastream database for the same financial years. This gave a total of 1825 firm years that met the selection criteria. Firm years were reclassified as derivative user and non-user, based on their reported annual reports disclosure. From this 1476 firm years belonged to the derivative users category. Table 6.1 Panel A shows the summary statistics of the derivatives users and their respective fair values based on their reported financial year end data while Panel B summarises the data overall.

Table 6.1
Summary statistics - FTSE 350 non-financial derivative users

Panel A

Year	Total FTSE 350 non-financial firms	Total FTSE 350 Derivatives users	FTSE 350 Derivatives user proportion	Derivatives fair values sum (£m)	Mean
2005	210	155	73.8	69,342.6	447.4
2006	221	177	80.5	53,029.2	299.6
2007	224	184	82.1	58,803.2	319.6
2008	227	195	85.9	13,853.9	710.5
2009	232	193	83.2	78,254.7	405.5
2010	235	192	81.7	77,557.5	404.0
2011	238	192	80.7	73,060.1	380.5
2012	238	188	79.0	60,328.7	320.9

Panel B

	No of observations	Observations of FTSE 350 derivatives users	User proportion (%)
Derivatives users	1825	1476	80.9
Derivatives non-users	1825	349	19.1

Table 6.1 Panel A shows the summary statistics for FTSE 350 non-financial firms for 2005 - 2012. Total derivatives fair values is defined as the sum of derivatives assets and absolute value of the derivatives liabilities at the balance sheet end date. Panel B summarises the panel A data by pooling the study period.

As discussed in the research methods and data sources chapter, most derivatives value relevance studies have adopted the method of Allayannis and Weston (2001), who examined whether the use of foreign currency derivatives affects firm value. Using Tobin’s Q as a proxy for firm value, their findings show a positive relationship between foreign currency derivatives and firm value. Moreover, they argued that using Tobin’s Q as a proxy for firm value makes comparison of the results across firms relatively easier than using stock returns or accounting measures. They defined Tobin’s Q as the ratio of the market value of the firm to the replacement cost of assets at the end of the financial year for each firm. They calculated the replacement cost of assets as the sum of the replacement cost of fixed assets and the inventories. They also carried out a sensitivity analysis using three alternative measures.

(i) the measure suggested by Perfect and Wiles (1994), which relies on initial conditions and “recursive build-up” of fixed asset replacement costs
(ii) the ratio of the market value of the firm to the book value of assets
(iii) the ratio of the market value of the firm to the book value of total sales

However, their results with these alternative variables were consistent with their original findings. Therefore this study used the ratio of market value of the firm to the book value of assets as a measurement of firm value.

6.3.1 Dependent variable

Following Allayannis and Weston (2001), almost every subsequent study used the natural logarithm of Tobin's Q as a dependent variable proxy for firm value. The literature identified several advantages of using the logarithm of Tobin's Q. One such advantage is that the natural logarithm transforms the skewed distribution of Q to a more symmetric distribution (Allayannis and Weston, 2001). Further, Jankensgård (2015) suggested that log transformation effectively allows for the interpretation of regression coefficients in percentages, hence benefiting readers.

A number of other studies have used alternative variables to proxy Tobin’s Q. Cummins, Lewis, & Wei (2006), McShane, Nair & Rustambekov (2011) and Hoyt &

Liebenberg (2011) all used the market value of equity plus the book value of liabilities divided by the book value of assets as Tobin's Q. Similarly, Lins (2003), Hagelin & Pramborg (2004), Jin and Jorion (2006), Júnior & Laham (2008), Fauver & Naranjo (2010) and Bashir, Sultan & Jghef (2013) used book value of total assets minus book value of equity plus market value of equity divided by book value of total assets as Tobin's Q. As a proxy for firm market value, the current study used market capitalisation as at the end of the financial year while the replacement cost of assets was proxied by the book value of total assets. Hence, the following calculations were used to calculate firm value in current study.

Firm Value = Log (market value of equity / book value of total assets).

6.3.2 Hedging variables

As discussed in section 6.1, the majority of studies found a positive relationship between derivatives use and firm value. Furthermore, in non-financial firms derivatives use was deemed to be a result of hedging. This may lead to the belief that hedging has an effect on firm value. In order to examine how hedging influences firm value, the current study used two variables. The first is an indicator variable with the value of one if a firm reported a fair value of derivatives at a balance sheet date; zero otherwise. The second is a continuous variable to represent the extent of derivatives usage, measured as the ratio of the total fair value of derivative assets and absolute value of derivatives liabilities, scaled by the total of assets and absolute value of liabilities of the firm. Using two variables serves several purposes. Including Allayannis and Weston (2001), the majority of previous studies used a dummy variable to proxy derivatives use. A dummy variable may represent the firms decision to use derivatives. However it does not measure the extent of derivatives usage. As derivative fair values closely align with the market value of derivatives, using fair values to measure the extent of derivatives use gives a more precise measure of the value relevance of derivatives. Moreover, in both cases positive coefficients suggest that risk management using derivatives add value to a firm. Unlike in other studies, which only focused on one or two derivative instrument types such as forwards or interest rate swaps, this section assesses overall derivatives use on firm value, hence reflecting real world hedging rather than assuming a hypothetical scenario where only one derivative instrument is being used by all firms in the population.

6.3.3 Control variables

In order to assess whether derivatives use influences firm value, controlling for other variables that could have an impact on firm value is necessary. Literature has identified several such variables. The next section will identify these variables and the theoretical reasons behind using them.

6.3.3.1 Firm size

Previous studies have found a significantly positive relationship between firm size and hedging. Therefore the expectation is that the increase in firm value is positively related to firm size among derivatives users. Nevertheless, the evidence about the impact of size on firm value is somewhat mixed. Allayannis and Weston (2001) found a negative relationship between firm size and the value of a firm. They concluded that a 1% increase in firm size would lead to a 7% decline in firm value. Furthermore Ang, Chua, and McConnell (1982) argued that bankruptcy costs increase less than proportionately as firm size increases suggesting that for larger firms, bankruptcy costs may be less significant due to bankruptcy costs constitute a smaller portion of firms assets. On the other hand the opposite is true for smaller firms as smaller firms have greater incentive to hedge, so that they can reduce the probability of bankruptcy, which may take a higher proportion of their assets Velasco (2014). Similar to Allayannis and Weston (2001), Jankensgård (2015) and many others, current study used the natural logarithm of total assets to control firm size[37]. Furthermore using natural logarithm minimises the statistical issue of distribution symmetry of total assets, if there is any.

[37] Firm size is defined as the log of the total assets where total assets represent the sum of total current assets, long term receivables, investment in unconsolidated subsidiaries, other investments, net property plant and equipment and other assets

6.3.3.2 Access to financial markets

Allayannis and Weston (2001) and Servaes (1996) argued that even if hedgers relinquish projects due to lack of access to financial markets, Tobin's Q ratio may still remain high, mainly because then firms are highly likely to undertake only positive NPV projects. Furthermore, in practice information about the inability to obtain sufficient funding for these projects may not available to investors; also these projects can be commenced at a future date when funding is available. Similar to Allayannis and Weston (2001) and Jin and Jorion (2006), the current study used a dummy variable where value equals 1 if a firm paid out dividends during the financial year; otherwise zero. The underlying principle behind using dividends to proxy access to financial markets is that the payment of dividends can be taken as the ability to access financial markets as capital-constrained firms are less likely to pay dividends, hence giving them a lower Q value. Therefore the current study expects to see a positive relation between dividend pay-outs and firm value.

6.3.3.3 Profitability

Compared to less profitable firms, profitable firms' share prices are likely to achieve a higher price with a premium, especially when the hedgers are more profitable they are likely to have a larger Q (Allayannis and Weston, 2001; Jin and Jorion, 2006; Hoyt and Liebenberg, 2011). Further Firms with higher profitability are expected to have more resources and internally generated funds to reinvest in the positive NPV projects that ultimately lead to a higher firm value. Likewise, Jin and Jorion (2006) argued that hedging with derivatives increases firm value if these hedged positions carry a premium that is not commensurate with risk; also when active trading strategies create a return. Based on these arguments this study expects a positive relationship between profitability and Tobin's Q. The majority of previous studies (Allayannis and Weston, 2001; Jin and Jorion, 2006) used return on assets (ROA), as defined by the ratio of net income to total assets, to proxy the profitability.

6.3.3.4 Leverage

A firm’s capital structure may be related to its value (Allayannis and Weston, 2001; Jin and Jorion, 2006). The trade-off theory, which discussed the balance between costs and benefits of equity financing and debt financing, suggests that leverage can increase firm value due to the tax benefits of debt. Some studies (Dolde, 1995) found that highly leveraged firms are likely to manage their risk by derivatives. Similarly, some studies (Allayannis and Weston, 2001) found a positive relationship between leverage and firm value. Nonetheless, some empirical studies have shown a weak (Titman and Wessels, 1988) or negative (Fan, Titman Twite, 2012) relationship between leverage and firm value; the reason being that greater debt level could lead to financial distress, pointing towards diminishing firm value. These contradictory arguments highlight the importance of controlling for leverage in the analysis. Leverage defined by total debt divided by total assets was therefore included as a control variable in the regression models.

6.3.3.5 Investment growth

Allayannis & Weston (2001); Allayannis, Lel & Miller (2003); Jin & Jorion (2006) and Fauver & Naranjo (2010) all suggested that future investment opportunities have an impact on firm value. The underlying argument behind this is that if a firm has numerous investment opportunities that increases cash flows, investors would value these firms higher compared to firms with fewer investment opportunities. The current study used a capital expenditure variable defined by the ratio of capital expenditure to total assets. The study expects a positive relationship between capital expenditure and firm value.

6.3.3.6 Liquidity

A firm’s ability to meet its financial obligations in line with its payment schedules has an impact on its value. Financially constrained firms may carry a higher Tobin’s Q as they are likely to only be involved in positive NPV projects. The current study used Quick ratio measured by the total of cash & equivalents and net receivables over current liabilities to control for liquidity. As cash-constrained firms may have a higher Tobin's Q, conversely firms with higher liquid assets would have a lower Tobin's Q; thus the study expects a negative relationship between liquidity and firm value.

6.3.3.7 Time effects

In order to control for time effect year dummies have been included in the regression as it will show the year impacts on Q, as well as all other independent variables.

The determination of variables, the rationale behind selecting these variables and the estimation model selection process were carried out in section ‘3.6 Regression models – Value relevance of derivatives use’. This will enable the reader to understand the logic behind the development of the models and ex ante predictions for the variables.

6.4 Empirical Results

6.4.1 Summary Statistics – Value relevance of derivatives use

Table 6.2 shows the summary statistics for the main variables used in the value relevance of the derivatives use study. Panel A shows the data for all firms in the data set while panel B and panel C present the data for derivatives users and non-users respectively. As this section specifically intends to investigate the nature of the use of derivatives by UK non-financial firms an indicator variable (equals 1 if firm used derivatives, 0 otherwise) and a continuous hedging variable named ‘Hedge’ (defined as the fair value of derivatives scaled by the total assets) have been included in the analysis.

Table 6.2 panels B and C data show that approximately 81% of the firm years in the dataset belonged to the derivative users category. Additionally, panel A data shows the mean value of assets in FTSE 350 non-financial firms was £6,511.3 million during 2005 – 2012; further total mean sales were £5,537.7 million during the study period. Moreover, the respective median value of total assets and total sales for all firms was £1,238.4 million and £1,113.6 million. As the median is substantially deviate from the mean, the natural logarithms of total assets and total sales have been used to proxy the firm size, hence controlling the distribution asymmetry issue.

Similarly, capital expenditure in table 6.2 was 5.2% of total assets while ROA was 9.9% of total assets. In addition to capital expenditure 4.2% of net sales was reinvested as research & development between 2005-2012 by FTSE 350 non-financial firms. Furthermore, panel A data shows that average leverage was 0.224, meaning that the total debt of FTSE 350 non-financial firms was 22.43% of total assets. In other words total debt was nearly quarter percent of the total assets. The mean Quick ratio was 1.213, meaning that FTSE 350 non-financial firms had liquid assets of 121% compared to current liabilities in case they needed to meet their short term financial obligations. Further this suggests that on average at any given point firms have the financial capacity to pay off their debts if required.

Table 6.2
Summary statistics - Value relevance of derivatives use (2005 - 2012)

	No. obs.	Mean	Std. Dev.	Median	Min	Max
Panel A: All firms						
Total assets (millions)	1825	6,511.26	19,700.00	1238.40	11.39	219,000.00
Total sales (millions)	1824	5,537.69	20,500.00	1113.60	0.000	293,000.00
Market value of the firm (millions)	1774	6,100.53	16,100.00	1188.99	35.09	146,000.00
Derivatives use measure						
Derivatives user dummy	1825	0.809	0.393	1.000	0.000	1.000
Hedge						
Firm Value measure						
Firm Value	1774	0.040	0.818	0.031	-3.762	3.848
Control variables						
Firm size	1825	14.176	1.639	14.029	9.340	19.206
Dividend pay out	1807	0.853	0.354	1.000	0.000	1.000
Capital Expenditure	1823	0.053	0.050	0.038	0.000	0.618
Return on Assets	1823	0.100	0.134	0.085	-0.836	2.718
Leverage	1825	0.224	0.178	0.211	0.000	1.345
Quick Ratio	1825	1.213	2.333	0.863	0.000	9.373
Panel B: Firms with derivatives						
Total assets (millions)	1476	7,839.42	21,600.00	1674.00	40.50	219,000.00
Total sales (millions)	1476	6,690.27	22,700.00	1472.01	0.000	293,000.00
Market value of equity (millions)	1444	7,225.05	17,600.00	1432.03	35.09	146,000.00
Derivatives users						
Derivatives user dummy	1476	1.000	0.000	1.000	1.000	1.000
Hedge						
Firm Value measure						
Firm Value	1444	-0.064	0.774	-0.062	-3.762	2.552
Control variables						
Firm size	1476	14.463	1.583	14.330	10.609	19.206
Dividend pay out	1465	0.891	0.312	1.000	0.000	1.000
Capital Expenditure	1475	0.050	0.044	0.037	0.000	0.339
Return on Assets	1475	0.090	0.095	0.080	-0.836	0.741
Leverage	1476	0.245	0.171	0.232	0.000	1.345
Quick Ratio	1476	1.019	1.501	0.826	0.000	9.373
Panel C: Firms without derivatives						
Total assets (millions)	349	894.15	1296.52	406.55	11.39	9960.75
Total sales (millions)	348	649.15	774.99	387.26	0.00	4788.43
Market value of equity (millions)	330	1179.92	1580.93	723.50	38.72	13500.00
Firm Value measure						
Firm Value	330	0.494	0.853	0.517	-2.724	3.848
Control variables						
Firm size	349	12.961	1.275	12.915	9.340	16.114
Dividend pay out	342	0.690	0.463	1.000	0.000	1.000
Capital Expenditure	348	0.063	0.069	0.044	0.000	0.618
Return on Assets	348	0.141	0.232	0.111	-0.388	2.718
Leverage	349	0.137	0.180	0.065	0.000	0.826
Quick Ratio	349	2.037	4.260	1.061	0.033	8.764

In the above table 6.2 Panels A, B and C presents the summary statistics of the main variables used in the value relevance of derivative use study; this includes all non-financial firms, derivatives users and derivatives non-users amongst FTSE 350 Index non-financial firms listed on the London Stock Exchange from 2005 to 2012 (Study period). Firm value is defined as the log of, market value of firm assets divided by the replacement cost of assets. The market value of firm proxies by the market capitalisation, while replacement cost is defined as the book value of total assets. Derivatives user dummy equals 1 if firm used derivatives, 0 otherwise. The derivatives usage variable is defined as the gross fair value derivatives scaled by the total assets. The size of the firm is defined as the log of total assets where total assets represent the sum of total current assets, long term receivables, investment in unconsolidated subsidiaries, other investments, net property plant and equipment and other assets. Dividend is determined by a dummy with a value 1 if dividends per share are positive, 0 otherwise. Capital expenditure is examined using the ratio of capital expenditures to total assets. Return on assets is defined by the ratio of net income to total assets. Leverage is defined as total debt divided by total assets. Quick ratio is measured by the total of cash & equivalents and net receivables over current liabilities.

6.4.2 Univariate analysis - Value relevance of derivatives use

In this sub-section, I begin to address the main derivatives value relevance hypothesis. Prior to the investigation of the above hypothesis using multivariate analysis, this has been carried out in a univariate environment as univariate tests give a direct comparison of firm value between non-hedgers and hedgers.

Similar to Allayannis & Weston (2001), Jin & Jorion (2006) and Fauver & Naranjo (2010) two sample tests have been used for univariate analysis to examine the difference between the mean firm value hedgers and non-hedgers.

Table 6.3, panel A, presents the mean firm values for the FTSE 350 non-financial derivative users and non-users for 2005 - 2012. Additionally panel B shows the univariate analysis of the mean differences between control variables. The mean firm value (i.e. log(MVE/BVA) for derivative user variable is -0.064. As -0.064 for log(MVE/BVA) means 0.94 for MVE/BVA implies that on average Market value is less than book value. Comparing this with the non-user mean firm value of 0.494 gives a statistically significant (at 1% level) negative value of 1.262.

Furthermore Table 6.3 panel B results show a statistically significant (at 1%) mean difference between derivatives users and non-users for all control variables. On average, size appeared to be higher for users by 1.50209 units compared to non-users, supporting the argument that firm size is a determinant factor for using derivatives. Further, 89% of the derivatives users paid dividends while this figure was only 69% among non-users of derivatives.

In the current study the mean difference between capital expenditure is -0.012380 indicating that non-derivative users were, by this measure, less financially constrained. Furthermore, non-derivatives users produced a higher return on assets compared to derivatives users.

Table 6.3
Univariate analysis - Comparison of firm value: Derivative users vs non-users

Description		Derivatives user (1)	Derivatives non-user (2)	Difference (3) = (1) – (2)	z-statistics
Panel A: Differences in mean firm value					
	Mean	-0.064	0.494	-0.558***	11.583
	Std.Dev	0.774	0.853		
	N	1,444	330		
Panel B: Differences in Control Variables					
Firm size					
	Mean	14.463	12.961	1.502***	-16.503
	N	1,476	349		
Dividend pay out					
	Mean	0.891	0.690	0.201***	-9.669
	N	1,465	342		
Capital Expenditure					
	Mean	0.050	0.063	-0.012***	4.158
	N	1,475	348		
Return on Assets					
	Mean	0.090	0.141	-0.051***	6.424
	N	1,475	348		
Leverage					
	Mean	0.245	0.137	0.108***	-10.473
	N	1,476	349		
Quick Ratio					
	Mean	1.019	2.037	-1.018***	7.441
	N	1,476	349		

Table 6.3 Panel A presents the univariate comparison of firm value defined as log of the market value of equity scaled by book value of total assets between derivative users and non-users. Similarly Panel B compares the other control variables between derivative users and non-users. The data includes all FTSE 350 Index non-financial firms listed on the London Stock Exchange from 2005 to 2012. A firm is a user of derivatives for a given year if the firm reported any derivative fair values in their balance sheet at the balance sheet date. The z-statistics and their related p-values are based on the two-sample Wilcoxon rank-sum (Mann-Whitney) test which examines the differences in the means between derivatives user firms and non-users. Significance levels at 1%, 5% and 10% were indicated with ***, **, * respectively.

The positive mean value difference of 0.107 for leverage means that firms using derivatives have a higher leverage, supporting Graham and Smith's (1999) argument that hedging can increase debt capacity to take the advantage of tax shield advantages. Finally quick ratio results show that derivative users had lower cash & equivalents and net receivables over their current liabilities than non-derivative users. In other words derivatives users appeared to have lower levels resources compared to non-users. Section 6.4.3 below extends univariate results into multivariate settings where the study will examine the value relevance of the decision to use derivatives as well as their usage.

6.4.3 Multivariate analysis - Value relevance of derivatives use

In order to produce more fully meaningful and interpretable results, it is necessary properly to control for variables that could have an impact on firm value in a multivariate setting is necessary. Therefore control variables identified in section 6.3.3 applied in multivariate regressions.

6.4.3.1 Pearson Correlation Matrix

In order to examine the level of multicollinearity in control variables, the Pearson correlation coefficient technique was used. Table 6.4 shows the Pearson correlation coefficient matrix of the independent variables used in the value relevance of derivatives use study.

Table 6.4
Pearson Correlation Matrix - Value relevance of derivatives use

Variable	Size	Div	Cap_exp	ROA	Lev	Quick
Size	1.0000					
Div	0.1701*	1.0000				
Cap_exp	-0.0312	-0.1746*	1.0000			
ROA	-0.2069*	0.2131*	0.0492*	1.0000		
Lev	0.2658*	0.0564*	0.0663*	-0.2077*	1.0000	
Quick	-0.1698*	-0.1945*	0.1113*	-0.0046*	-0.1634*	1.0000

Table 6.4 shows the Pearson Correlation Matrix for Independent Variables used to examine the value relevance derivatives use. Size is the log of the total assets where total assets represent the sum of total current assets, long term receivables, investment in unconsolidated subsidiaries, other investments, net property plant and equipment and other assets. Dividend is a dummy variable with a value 1 if dividends per share is positive, 0 otherwise. Capital expenditure was examined using the ratio of capital expenditures to total assets. Return on assets is defined by the ratio of net income to total assets. Leverage is total debt divided by total assets. Quick is the total of cash & equivalents and net receivables over current liabilities. A star next to the correlation score indicates that the result is statistically significant at 5% level of significance.

The largest positive correlation of 0.2658 was between size and quick ratio. The largest negative correlation of -0.2077 was between return on assets and leverage. This indicates that multicollinearity is present in the data set, however it is not severe.

Berkman and Bradbury (1996) argued that this level of multicollinearity is acceptable in financial data. Hence multivariate statistical techniques can be applied to the data set.

6.4.3.2 Estimation model selection process

In order to determine the most appropriate model amongst pooled OLS, fixed effect (FE) or random effect (RE), similar to chapter 5 following methodology has been used throughout this chapter.

d) Estimation model selection process - Stage 01: OLS vs FE model

Table 6.5

Conditional fixed - effects logistic regression	Number of observations = 1771
Group variable: Firm	Number of groups = 237
	Obs per group: min = 1
	avg = 7.5
	max = 8
	F(7,1527) = 41.15
Rho = 0.6025	Prob > F = 0.0000

Variable	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
Derivatives user	-0.010	0.108	-0.09	0.929	-0.221	0.202
Size	-0.549	0.067	-8.21	0.000	-0.677	-0.416
Div	-0.188	0.126	-1.49	0.136	-0.436	0.059
Cap_exp	1.202	0.936	1.28	0.199	-0.634	3.038
ROA	7.521	0.296	25.37	0.000	6.940	8.102
Lev	-1.520	0.338	-4.49	0.000	-2.184	-0.856
Quick	0.014	0.014	1.02	0.308	-0.013	0.042
Constant	8.935	0.939	9.51	0.000	7.093	10.777

Table 6.5 results compare the suitability of the results of pooled OLS with the results of the FE model. Rejection of H_0 indicates the presence of changes over time. In the above less than 0.05, Prob > F suggests a rejection of the null hypothesis; hence the FE model suits better comparison with the pooled OLS model.

e) Estimation model selection process - Stage 02: Pooled OLS vs RE model (Breusch and Pagan Lagrange Multiplier Test)

The Breusch and Pagan Lagrange Multiplier test has been used to examine the properties of random effects model based on the pooled OLS residuals.

Table 6.6

Random-effects logistic regression	Number of observations = 1771
Group variable: Firm	Number of groups = 237
	Obs per group: min = 1
	avg = 7.5
	max = 8
	Wald chi2(7) = 1330.20
	Prob > chi2 = 0.0000

Variable	Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]
Derivatives user	-0.106	0.099	-1.08	0.281	-0.299	0.087
Size	-0.292	0.036	-8.20	0.000	-0.362	-0.222
Div	-0.345	0.111	-3.09	0.002	-0.563	-0.127
Cap_exp	0.453	0.799	0.57	0.570	-1.113	2.020
ROA	8.647	0.277	31.23	0.000	8.104	9.190
Lev	-1.030	0.269	-3.83	0.000	-1.557	-0.504
Quick	0.035	0.013	2.59	0.010	0.008	0.061
Constant	5.330	0.500	10.67	0.000	4.350	6.309
rho	0.4190					

Breusch and Pagan Lagrangian multiplier test for random effects

User[Firm,t] = Xb + u[Firm] + e[Firm,t]

Estimated results:

	Var	sd = sqrt(Var)
Firm value	4.233	2.057
e	0.971	0.986
u	0.700	0.837

Test: Var(u) = 0

chibar2(01) = 923.72

Prob > chibar2 0.0000

Table 6.6 compares the results of pooled OLS with the results of RE model. Less than 0.05, Prob > chibar2 suggests a rejection of the null hypothesis; hence the RE model suits better comparison with the pooled OLS model.

f) Estimation model selection process - Stage 03: FE vs RE model (Hausman test)

In order to determine suitability between the FE and RE models the Hausman test has been used. The Hausman test examines whether individual effects are uncorrelated with the other regressors in the model.

Table 6.7

	---- Coefficients ----			
	(b) fe	(B) re	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
Derivatives user	-0.009	-0.106	0.097	0.051
Size	-0.547	-0.292	-0.255	0.059
Div	-0.188	-0.345	0.157	0.067
Cap_exp	1.202	0.453	0.749	0.539
ROA	7.521	8.647	-1.126	0.127
Lev	-1.520	-1.030	-0.490	0.222
Quick	0.014	0.035	-0.020	0.005

b = consistent under Ho and Ha;

B = inconsistent under Ha, efficient under Ho;

Test: Ho: difference in coefficients not systematic

chi2(7) = (b-B)'[(V_b-V_B)^(-1)](b-B)

= 106.45

Prob>chi2 = 0.0000

Less than 0.05, Prob > chi2 suggests a rejection of the null hypothesis that the individual effects are correlated with regressors; therefore the FE model preferred the over RE model. Considering the step 1 - step 3 results above, the FE model can be identified as the most appropriate model to investigate the relationship between firm value and the decision to use derivatives.

6.4.3.3 Value relevance of derivatives use - Fixed effect model

In this FE regression, a dummy variable, which takes the value 1 if a firm reported a derivatives fair value and 0 otherwise, is used as the main variable. Furthermore, in order to control unobservable firm-specific variables, which could have an impact on firm value, the Hausman and Taylor (1981) fixed-effects model was used.

Table 6.8

Decision to use derivatives and firm value with hedging dummy variable

Dependent variable: ln (firm value)	**Expected sign**	**Fixed effects model (Model 6.1)**
Observations		1771
No of groups		237
Derivatives user dummy	+	0.016 (1.6%) 0.43
Size	+/-	-0.317*** -10.36
Div	+	0.166*** 3.74
Cap_exp	+	0.374 1.14
ROA	+	1.349*** 13.06
Lev	-	-0.854*** -7.03
Quick	-	0.003 0.72
Constant		4.506*** 10.88
2006		0.131*** 3.87
2007		0.001 0.01
2008		-0.556*** -15.25
2009		-0.117*** -3.17
2010		-0.013 -0.33
2011		-0.139*** -3.59
2012		-0.001 -0.03
R-Sq within		0.4813
Rho		0.740

Table 6.8 shows the multivariate regression results of the use of derivatives on firm value. The data consist of all FTSE 350 non-financial firms listed in the London Stock Exchange between 2005-2012. Model 6.1 is based on 1771 observations. Dependent variable is the log of the market value of a firm divided by replacement cost of assets where market value of firm proxies by the market capitalisation while replacement cost is defined as the book value of total assets. Derivatives user dummy equals 1 if firm used derivatives, 0 otherwise. The size of the firm is defined as the log of the total assets where total assets represent the sum of total current assets, long term receivables, investment in unconsolidated subsidiaries, other investments, net property plant and equipment and other assets. Dividend is determined by a dummy with a value of 1 if dividends per share are positive, 0 otherwise. Capital expenditure was examined using the ratio of capital expenditures to total assets. Return on assets is defined by the ratio of net income to total assets. Leverage is defined as total debt divided by total assets. Quick ratio is measured by the total of cash & equivalents and net receivables over current liabilities. ***, ** and * indicate significance levels at 1%, 5%, and 10% respectively. T-statistics are based on White (1980) standard errors.

Table 6.8 findings suggest that derivatives users may have a higher firm value than non- derivative users by 1.6% of firm value, suggesting that there is a hedging premium amongst derivative users; however the estimate was not statistically significant. Nevertheless the estimated coefficient is of the same sign as those found by Allayannis and Weston (2001), Carter *et al*., 2006, Clark and Judge, (2009) and Allayannis *et al*. (2011) who reported a typical value in the range of 3% to 16%. Similar to Allayannis and Weston (2001), firm size negatively related to firm value. Furthermore, profitability proxied by ROA has a positive sign at 1% significance level meaning that profitable firms are highly likely to have a higher firm value.

Table 6.8 results show a highly significant (1%) positive relationship between the dividend variable and firm value, denoting that investors in fact value firms higher when a firm announces dividend payments. This is different to Allayannis and Weston's (2001 p.252) predictions where they stated "If hedgers forgo projects because they are not able to obtain the necessary financing, their Q ratio may remain high because they undertake only positive net present value (NPV) projects. If a firm paid a dividend, it is less likely to be capital constrained and may thus have a lower Q".

Literature suggests (Allayannis & Weston, 2001; Allayannis, Lel & Miller, 2003; Jin & Jorion, 2006; Fauver & Naranjo, 2010) having opportunities for future investment and growth prospectus also contributed towards a higher firm value. In the current study the coefficients of capital expenditure showed the expected sign, though this was not statistically significant.

Furthermore, Allayannis and Weston (2001) recorded negative coefficients for leverage, stating that firms with higher Tobin's Q get increased attention on their debts, leading to a lower firm value. This study shows a negative relationship between firm value and leverage at 1% significance level, supporting this argument. Therefore the above multivariate results suggest that firms with derivative fair values in the balance sheet are valued marginally lower by investors. Next, in section 6.4.3.4 the derivative user variable will be replaced with a continuous variable where derivatives usage is measured as the ratio of the total fair values of derivatives to the total assets of a firm.

6.4.3.4 Value relevance and extent of derivatives use - Fixed effect model results

This section examines the outcome of the extent of hedging on firm value by using a continuous hedging variable[38]. By doing so, the study intends to assess how firm value relates to the extent of hedging. Moreover it will enhance the validity and robustness of the findings in section 6.4.3.3 as the data consist of all FTSE 350 non-financial firms listed in the London Stock Exchange between 2005-2012.

Table 6.9 shows the regression results using the fixed effect model. One of the main differences between this study and the widely cited Allayannis and Weston (2001) study is that they only limited their study to examine the relationship between decision to use derivatives and firm value; while current study extended this assessing the association between extent of derivatives use and firm value using fair values of derivatives. As the current study use fair values of derivatives, the regression results reflect a direct connection between some economic significance of derivatives use (albeit an accounting measure, a measure subject to fair value adjustment by reference to the market) and the value of the firm.

[38] Please see section 6.3.2 for definitions

Consistent with the results in table 6.8, the findings in table 6.9 suggests that firms using derivatives are valued more highly compared to non-users, though results are not statistically significant. Nevertheless results are of the expected sign.

Table 6.9

Usage of derivatives and firm value with continuous hedging variable

Dependent variable: In (firm value)	**Expected sign**	**Fixed effects model (Model 6.2)**
Derivatives usage	+	0.217
		0.44
Size	+/-	-0.244***
		-6.71
Div	+	0.134***
		2.79
Cap_exp	+	0.490
		1.15
ROA	+	2.021***
		13.68
Lev	-	-0.911***
		-6.89
Quick	-	0.004
		0.71
Constant		3.472***
		6.8
2006		0.109***
		3.04
2007		-0.017
		0.46
2008		-0.550***
		-14.02
2009		-0.138***
		-3.56
2010		-0.053
		-0.32
2011		-0.178***
		-4.35
2012		-0.010
		-0.24
	Observations	1441
	No of groups	215
	R-Sq within	0.5071
	Rho	0.749

Table 6.9 shows the multivariate regression results of the use of derivatives on firm value. The data consist of all non-financial firms in the FTSE 350 Index listed on the London Stock Exchange between 2005 and 2012. The model 6.2 is based on 1441 observations. The dependent variable is the natural log of firm value where firm value described as the market value of firm assets divided by the replacement cost of assets. Market value of firm proxies by market capitalisation while replacement cost is defined as the book value of total assets. The hedge variable is defined as the ratio of gross derivatives fair value scaled by the total assets and absolute value of liabilities. The size of the firm is defined as the log of the total assets where total assets represent the sum of total current assets, long term receivables, investment in unconsolidated subsidiaries, other investments, net property plant and equipment and other assets. Dividend is determined by a dummy with a value of 1 if dividends per

share are positive, 0 otherwise. Capital expenditure was examined using the ratio of capital expenditures to total assets. Return on assets is defined by the ratio of net income to total assets. Leverage is defined as total debt divided by total assets. Quick ratio is measured by the total of cash & equivalents and net receivables over current liabilities. ***, ** and * indicate significance levels at 1%, 5%, and 10% respectively. T-statistics are based on White (1980) standard errors.

Furthermore table 6.9 results show that several control variables are statistically significant, and have the sign predicted by the theory. ROA was highly significant and positively related with firm value; which is consistent with the argument that profitable firms have a higher firm value. Leverage is also highly significant (1%), with a negative sign as expected. As previously (6.4.3.3) the sign of leverage is consistent with Allayannis and Weston (2001); Aggarwal and Zhao (2007) who document a negative relationship between leverage and firm value for US data. Similar to Allayannis and Weston (2001), Belghitar *et al.'s* (2013) coefficients of the size in table 6.9 were negative and significant[39]. However as firm size variable measured as a logarithmic value, hence log transformation of the coefficient value (-0.244) is 0.783. Therefore firm size in fact positively related to firm value. Simultaneously, a significant positive sign of the size with positive significant ROE suggests that larger profitable derivatives users are valued more highly than other firms that use derivatives. In addition, similar to Hoyt and Liebenberg (2015), the dividend variable showed a significant positive relationship. In both section 6.4.3.3 and 6.4.3.4 capital expenditure and quick ratio showed insignificant coefficients.

From empirical analysis on the decision to use derivatives and the extent of derivatives use on firm value, it is clear that the impact of hedging with derivatives on firm value is positively related in the current study. This supports the previous studies conducted using US data (Allayannis and Weston, 2001; Graham and Rogers, 2002; Carter *et al*., 2006). This further suggests that there are fundamental similarities between US firms and UK firms with regards to derivatives use.

[39] Table 6.9 shows that coefficient of the size variable is -0.244. As firm size variable measured as a logarithmic value log transformation of the coefficient is 0.783. Therefore firm size in fact positively related to firm value.

6.4.4 Value relevance of different instruments types

6.4.4.1 Univariate analysis - Value relevance of different derivatives instruments

This section begins by comparing means firm value as between users and non-users of difference derivative instrument types. The results are presented in table 6.10. The significance of differences between derivative instrument users and non-users are evaluated using t-test. Probability values along with their means, mean differences of the firm characteristics for derivative users and non-users and their firm values are also presented.

Univariate analysis results (Table 6.10) confirmed that there is a significant difference between mean firm values amongst derivatives users and non-users across all five instrument categories; firm values of non-derivatives users were higher than users. For interest rate swaps, the mean firm value of derivative users is -0.223 compared with 0.338 for non-users, this difference was also significant. For the cross currency swaps, the mean firm value for derivatives hedgers is -0.176 compared with 0.111 for non-users. Furthermore for commodity contracts and other derivatives, there was a statistically significant negative value difference of 0.21 and 0.161 respectively. For forwards, the difference between users and non-users was not statistically significant, however again non-users show a higher value than users.

Table 6.10

Univariate analysis - Comparison of firm value: Derivative users vs non-users

Description		User (1)	Non-user (2)	Difference (3) = (1) – (2)	z-statistics
Panel 1: Differences in mean firm value					
	Mean	-0.223	0.338	-0.562***	15.074
	Std. Dev	0.024	0.029		
	N	929	806		

Description		User (1)	Non-user (2)	Difference (3) = (1) – (2)	z-statistics
Panel 2: Differences in mean firm value					
	Mean	-0.176	0.111	-0.287***	6.405
	Std. Dev	0.034	0.023		
	N	443	1,292		

Description	User (1)	Non-user (2)	Difference (3) = (1) – (2)	z-statistics
Panel 3: Differences in mean firm value				
Mean	0.014	0.070	-0.056	1.394
Std. Dev	0.024	0.034		
N	1,005	730		

Description	User (1)	Non-user (2)	Difference (3) = (1) – (2)	z-statistics
Panel 4: Differences in mean firm value				
Mean	-0.146	0.064	-0.210***	3.508
Std. Dev	0.051	0.021		
N	215	1,520		

Description	User (1)	Non-user (2)	Difference (3) = (1) – (2)	z-statistics
Panel 5: Differences in mean firm value				
Mean	-0.084	0.077	-0.161	3.516
Std. Dev	0.039	0.023		
N	427	1,308		

Table 6.10 presents the univariate comparison of firm value defined as log of market value of equity scaled by book value of total assets between firms with and without the use of derivatives amongst five derivative instrument categories. Firms are all non-financial firms in the FTSE 350 Index listed on the London Stock Exchange between 2005 and 2012. A firm is an interest rate swap user if the firm reported any interest rate swap fair values for a given year. Similarly a firm is a cross currency swaps, forwards, commodity derivatives or other derivatives user if the firm reported any cross currency swaps, forwards, commodity derivatives or other derivative fair values for a given year. The Z-statistics and their related p-values are based on the two-sample Wilcoxon rank-sum (Mann-Whitney) test, which examines the differences in the means between derivatives user firms and non-users. Significance levels at 1%, 5% and 10% were indicated with ***, **, * respectively.

6.4.4.2 Multivariate analysis - Value relevance of different derivatives instruments - Fixed effect model results

This section investigates how different derivative instruments contribute to firm value. Derivative instruments divided into five categories namely, interest rate swaps, cross currency swaps. forward currency contracts, commodity contracts and other remaining derivatives as discussed in chapter 4. For every derivative instrument, but firm-year, usage has been calculated as the absolute value of the sum of the gross amount of derivative instrument assets and liabilities divided by the sum of the gross amount of the firm's total assets and liabilities. Table 6.11 presents the fixed effect regression results for years 2005 - 2012.

Interest rate swaps, cross currency swaps and forward currency contracts use were positively related to firm value while commodity contracts and other derivatives contributed negatively towards the value of a firm. Nevertheless only interest rate swaps (10% significance level), forwards (1% significance level) and derivatives categorised as commodity derivatives (1% significance level) appeared to be statistically significant. Furthermore, forward currency contracts use showed the largest coefficients while commodity contracts showed the smallest. The overall R-squared of the estimation shows that 33% of variation in log(Q) is explained by variation in the independent variables of the model.

With regards to control variables, coefficients of the size showed negative and significant values at 1% significance; similar results were reported by Allayannis and Weston (2001), Belghitar *et al.*'s (2013). Profitability proxied by ROA is positively and significantly (1%) related to firm value, meaning profitable firms are valued more highly by investors. Regression results of the dividend variable suggests that the market does not consider dividend as an indicator of firm value; regression coefficient was non-significant and negative.

Table 6.11
Value relevance of different derivatives instruments

Dependent variable: Firm value	Predicted sign	Fixed effects model (Model 6.3)
Interest rate swaps	+/-	6.923*
		1.86
Cross currency swaps	+/-	0.648
		0.29
Forward currency contracts	+/-	8.343***
		4.08
Commodity contracts	+/-	-7.036***
		-3.06
Other derivatives	+/-	-1.069
		-0.53
Size	+/-	-0.345***
		(-5.73)
Div	+	-0.096
		(-1.21)
Cap exp	+	0.224
		(0.31)
ROA	+	3.411***
		(13.80)
Lev	-	-0.446**
		(-2.02)
Quick	-	0.019*
		(1.70)
Constant		6.173***
		(7.31)
2006		0.099*
		(1.68)
2007		-0.074
		(-1.23)
2008		-0.485***
		(-7.48)
2009		-0.175***
		(-2.72)
2010		-0.036
		(-0.53)
2011		-0.169**
		(-2.47)
2012		0.031
		(0.43)
Observations		1402
No of groups		210
Overall R-Sq		0.3318
Rho		0.765

Table 6.11 shows the multivariate regression results of the use of derivatives on firm value. The data consist of all non-financial firms in the FTSE 350 Index between 2005 and 2012. The model 6.3 is based on 1441 observations. The dependent variable is the natural log of firm value where firm value is described as the market value of firm assets divided by the replacement cost of assets. Market value of firm proxies is by market capitalisation while replacement cost is defined as the book value of total assets. The hedge variable is defined as the ratio of gross derivatives fair value scaled by the total assets and absolute value of liabilities. The size of the firm is defined as the log of the total assets where total assets represent the sum of total current assets, long term receivables, investment in unconsolidated subsidiaries, other investments, net property plant and equipment and other assets.

Dividend is determined by a dummy with a value 1 if dividends per share are positive, 0 otherwise. Capital expenditure was examined using the ratio of capital expenditure to total assets. Return on assets is defined by the ratio of net income to total assets. Leverage is defined as total debt divided by total assets. Quick ratio is measured by the total of cash & equivalents and net receivables over current liabilities. ***, ** and * indicate significance levels at 1%, 5%, and 10% respectively. T-statistics are based on White (1980) standard errors and stated below regression coefficients of each row.

In addition, leverage is negatively related to firm value; these results are statistically significant. Furthermore these findings reiterate that a firm's capital structure may be related to its value (Allayannis and Weston, 2001; Jin and Jorion, 2006); on the other hand this could be due to financial distress; Fan *et al.* (2012) found a negative relationship between leverage and firm value. They argued that greater debt levels could lead to financial distress, further pointing towards diminishing firm value. Additionally quick ratio was statistically significant with 10% level of significance and showed a positive association to firm value.

6.4.5 Value relevance of different hedging categories

6.4.5.1 Univariate analysis - Value relevance of different hedging categories

This section compares firm value between non-users across different hedging categories. Results are presented in table 6.12. Z-statistics have been used to examine the significance of differences between users and non-users of particular hedging categories. Mean differences, their standard deviations, probability values along with their respective firm values are also presented (table 6.12).

Univariate analysis results (table 6.12) indicate that there is a significant difference between mean firm values of derivatives users and non-users across all three hedging categories.

The group representing fair value hedges has a mean firm value of -0.215 while non-fair value hedge users have a fair value of 0.005. Similarly cash flow hedge non-users reported a higher firm value figure of 0.036 while in net investment hedges this figure was -0.035.

Table 6.12

Univariate analysis - Comparison of firm value: Derivative users vs non-users

Description	User (1)	Non-user (2)	Difference (3) = (1) – (2)	z-statistics
Panel A1: Differences in mean firm value				
Mean	-0.215	0.005	-0.220***	5.742
Std. Dev	0.713	0.800		
N	476	929		

Description	User (1)	Non-user (2)	Difference (3) = (1) – (2)	z-statistics
Panel A2: Differences in mean firm value				
Mean	-0.100	0.036	-0.136***	2.805
Std. Dev	0.780	0.764		
N	1,090	315		

Description	User (1)	Non-user (2)	Difference (3) = (1) – (2)	z-statistics
Panel A3: Differences in mean firm value				
Mean	-0.194	-0.035	-0.159***	3.219
Std. Dev	0.610	0.816		
N	309	1,096		

Description	User (1)	Non-user (2)	Difference (3) = (1) – (2)	z-statistics
Panel A4: Differences in mean firm value				
Mean	-0.084	-0.044	-0.040	1.451
Std. Dev	0.772	0.789		
N	896	509		

Table 6.12 presents the univariate comparison of firm value defined as log of market value of equity scaled by book value of total assets between firms with and without the use of derivatives amongst hedging categories and derivatives fair values reported as FVTPL. Firms are all non-financial firms in the FTSE 350 Index between 2005 and 2012. A firm is a fair value hedge user if the firm reported any fair value hedge use for a given year. Similarly, a firm is a cash flow hedge, net investment hedge and FVTPL user if the firm reported any cash flow hedges, net investment hedges or FVTPL derivative fair values for a given year. The z-statistics and their related p-values are based on the two-sample Wilcoxon rank-sum (Mann-Whitney) test, which examines the differences in the means between derivatives user firms and non-users.

Derivatives use literature argues that hedging reduces the probability of expected cost of financial distress and increases the availability of internal funds, hence increasing investment opportunities leading to an increase in firm value. However, it is important to distinguish the differences between the impact of hedging on firm value with the impact of hedge accounting on firm value. The relationship between hedge accounting and firm value has been identified as an under-studied area by Panaretou, Shackleton and Taylor (2013). As the univariate results indicated, there is a significant difference between hedge accounting users and non-users. In order to enhance the reliability of the above findings, the effects of firm specific factors on firm value need to be controlled for. Hence the following section uses multivariate analysis in a cross sectional environment to achieve the above objective.

6.4.5.2 Multivariate analysis - Value relevance of different hedging categories - Fixed effects models

Univariate results in section 6.4.5.2 suggest that reporting derivative fair values under any of the hedging categories leads to a significantly different firm value to a non-user of the respective hedging category. In section 6.4.5.3, the above results will be investigated under a multivariate environment; fixed effects models have been used to control for variables that have an influence on firm value. Furthermore, continuous variables, defined as gross fair value of each hedging category scaled by gross assets and liabilities, have been used to examine the hypothesis in each case. The estimation sample only includes firm years which have derivatives. Table 6.13 below presents the results of the Fixed Effect model.

Table 6.13 results shows no significant contribution from fair value hedges or cash flow hedges to the value of a firm. Net investment hedge usage was negatively associated with firm value; this relationship was statistically significant. Consistent with this study’s results, previous studies also found that the financial effect on earnings of accounting for derivatives is limited (Singh, 2004; Guay and Kothari, 2003). Also, Pierce (2015) suggested that this may well be down to hedge accounting applying at the transaction level rather than at the firm level; further, in majority of cases the reported earnings from derivatives are found in other comprehensive income rather than in the income statement.

Table 6.13
Value relevance of different hedging categories

Dependent variable: Firm value	Predicted sign	Fixed effects model (Model 6.4) (Regression co-efficient & t-statistics)
Fair value hedge	+/-	-1.064 -0.42
Cash flow hedge	+/-	0.911 1.21
Net investment hedge	+/-	-9.741 -4.01***
Size	+/-	-0.255*** (-7.02)
Div	+	0.143*** (2.94)
Cap_exp	+	0.378 (0.87)
ROA	+	2.069*** (13.77)
Lev	-	-0.953*** (-7.11)
Quick	-	0.008 (1.09)
Constant		3.628*** (7.12)
2006		0.116*** (3.22)
2007		-0.010 (-0.29)
2008		-0.527*** (-13.40)
2009		-0.126*** (-3.24)
2010		-0.042 (-1.04)
2011		-0.178*** (-4.31)
2012		-0.008 (-0.16)
Observations		1402
No of groups		210
Overall R-Sq		0.3853
Rho		0.753

Table 6.13 shows the multivariate regression results of the use of derivatives on firm value. The data consist of all derivative user non-financial firms listed in FTSE 350 for year 2005 to 2012. The model 6.4 is based on 1402 observations. The dependent variable is the natural log of firm value where firm value is described as the market value of firm assets divided by the replacement cost of assets. Market value of firm proxies by the market capitalisation while replacement cost defined as the book value of total assets. The hedge variable is defined as the ratio of gross derivatives fair value scaled by the total assets and absolute value of liabilities. The size of the firm is defined as the log of the total assets where total assets represent the sum of total current assets, long term receivables, investment in unconsolidated subsidiaries, other investments, net property plant and equipment and other assets. Dividend determined by a dummy with a value of 1 if dividends per share are positive, 0 otherwise.

Capital expenditure was examined using the ratio of capital expenditure to total assets. Return on assets is defined by the ratio of net income to total assets. Leverage is defined as total debt divided by total assets. Quick ratio is measured by the total of cash & equivalents and net receivables over current liabilities. ***, ** and * indicate significance levels at 1%, 5%, and 10% respectively. T-statistics are based on White (1980) standard errors and stated below regression coefficients of each row.

Furthermore, table 6.13 results show that several variables were statistically significant. Profitability proxied by ROA had a positive relationship with 1% significant level. Similar to determinants of derivative use, the results in section 6.4.4.2 showed a negative association between leverage and firm value. On the other hand, despite some studies suggesting a lower Tobin's Q for firms with higher dividend distribution, the current results showed a positive relation between the dividend variable and firm value. This was significant at 1%, suggesting a very strong connection.

In order to increase the reliability of the findings, in section 6.5 sensitivity analysis will be carried out using Ohlson (1995) methodology.

Table 6.14 summarises the section 6.4 multivariate results below

Table 6.14
Summary - multivariate results

Regressions of Q as dep. var.	**Predicted sign**	**Table 6.8**	**Table 6.9**	**Table 6.11**	**Table 6.13**
		all firms	**all users**	**all users**	**hedge users**
		fixed effects	**fixed effects**	**fixed effects**	**fixed effects**
User dummy	+	no sig			
Usage/hedging continuous	+		no sig		
Usage | int swaps [continuous]	+/-			+ sig	
Usage | fx swaps [continuous]	+/-			no sig	
Usage | fx fwd [continuous]	+/-			+ sig	
Usage | commodity contracts [continuous]	+/-			- sig	
Usage | other derviatives [continuous]	+/-			no sig	
Hedge accounting | FV hedge [continuous]	+/-				no sig
Hedge accounting | CF hedge [continuous]	+/-				no sig
Hedge accounting | NI hedge [continuous]	+/-				- sig
Size	+/-	- sig	- sig	- sig	- sig
Div	+	+ sig	+ sig	no sig	+ sig
Cap_exp	+	no sig	no sig	no sig	no sig
ROA	+	+ sig	+ sig	+ sig	+ sig
Lev	-	- sig	- sig	- sig	- sig
Quick	-	no sig	no sig	+ sig	no sig

6.5 Sensitivity analysis

6.5.1 Value relevance of derivatives use - Ohlson (1995) valuation framework

Section 6.4.1 to 6.4.5 analysed the value relevance of derivatives use, isolating other factors which could have an impact on firm value. Section 6.5 examines the valuation implications of derivatives by using the Ohlson (1995) valuation framework. One of the advantages of using the Ohlson model is that it defined a conceptual framework that relates the market value of a firm to its book value of equity and future earnings (Gama, Segura and Filho, 2017). This approach allows the earnings and book value of equity to be broken down into their components; hence it enables examination of the relevance of different accounting elements (Barth *et al*., 2001).

6.5.1.1 Basic model

In this study the following model was selected as the basic model.

$$MV_{it} = \propto_0 + \beta_1 E_{it} + \beta_2 BV_{it} + \varepsilon_{it} \qquad \text{Equation 6.1}$$

In equation 6.1, MV_{it} is the market value of firm i at time t. t is three months after the financial year end date for each firm; it is assumed that once financial statements are released within three months all new information is incorporated into market value. E_{it} is the earnings of firm i at financial year end date. BV_{it} is the book value of equity of firm i at fiscal year end date. Additionally an error term ε_{it} is also included in the model to capture the impact of omitted variables.

Therefore the hypothesis can be stated as follows.

There is a positive relationship between firm value and the use of derivatives for hedging amongst UK firms.

6.5.1.2 Extended model - for derivative users

As per Barth *et al.* (2001), the extended model splits both earnings and book value of equity in equation 6.1 into two more components.

(i) Earnings decomposed into earnings from derivatives as well as adjusted earnings; where adjusted earnings is defined as earnings minus earnings from derivatives. (i.e. difference between earnings and total income/loss of hedge accounted derivatives and FVTPL derivatives)

(ii) Book value of equity broken down into two components; first is the total net fair value of derivatives and adjusted equity; where adjusted equity is the book value of equity minus total net fair value of derivatives (i.e. difference between net firm equity and the difference between fair values of derivatives reported in the balance sheet)

Therefore extended model can be stated as follows.

$$MV_{it} = \propto_0 + \beta_1 IS\_DERV_{it} + \beta_2 AE_{it} + \beta_3 BS\_DERV_{it} + \beta_4 ABS_{it} + \varepsilon_{it} \quad - \quad \text{Equation 6.2}$$

Table 6.15 reports the descriptive statistics for the variables used in equation 6.2.

Table 6.15
Descriptive statistics of variables for pooled data during 2005 - 2012

	Mean	SD	Min	Max
Eq 01 - Firm year observations of all firms :1824				
MV	7.558	9.299	0.014	161.216
E	0.375	0.555	-5.618	4.745
BV	2.915	5.932	-1.216	83.986
Eq 02 - Firm year observations of derivative users : 1411				
MV	7.789	9.285	0.077	161.216
IS_DERV	-0.010	0.122	-1.445	1.521
AE	0.415	0.591	-5.639	4.721
BS_DERV	-0.020	0.167	-1.625	0.764
ABS	3.119	6.416	-1.125	84.007

In table 6.15 MV is the market value measured three months after the financial year end date; E and BV represent earnings and book value of equity at the fiscal year end date respectively; IS_DERV is the financial year end earnings from derivatives; AE is the adjusted earnings (the difference of between earnings and IS_DERV at the end of the financial year); BS_DERV is the book value of net derivatives fair values at the end of the financial year; ABS is the adjusted book value (the difference between book value and BS_DERV at the end of the financial year); SD column represents the standard deviation. All variables are in GBP millions and have been deflated by the number of shares (NOSH). Table 6.15 data shows a slightly higher market value with a lower standard derivation for derivative users.

Table 6.16
Pearson Correlation matrix

Variable	MV	IS_DERV	AE	BS_DERV	ABS
MV	1.0000				
IS_DERV	-0.0535	1.0000			
AE	0.6082*	-0.1904*	1.0000		
BS_DERV	-0.0684*	0.3398*	-0.0215	1.0000	
ABS	0.5443*	-0.0727*	0.4018*	-0.0110	1.0000

MV is the market value measured three months after financial year end date; IS_DERV is the financial year end earnings from derivatives; AE is the adjusted earnings (the difference of between earnings and IS_DERV at the financial year end); BS_DERV is the book value of net derivatives fair values at the financial year end; ABS is the adjusted book value (the difference of between book value and BS_DERV at the financial year end); All variables have been deflated by the number of shares. A star next to the correlation score indicates that the result is statistically significant at 5% level of significance.

Table 6.16 presents the Pearson correlations for derivatives users. The adjusted earnings and adjusted book value of equity are individually positively related to the market value with 5% level of statistical significance, while income from derivatives and the net book value of derivative positions are negatively related to market value. Further results suggest some statistically significant associations between determinant variables. For example financial year end earnings from derivatives were negatively associated with adjusted book value. However, the intention here is to apply the extended model as per Barth et al (2001), by splitting both earnings and book value of equity to its composites to understand how these individual components are related to market value.

6.5.1.3 Analysis and results - value relevance of derivatives use

Equation 6.1 in section 6.5.1.1 has been used as the base model to estimate an approximation of Ohlson's (1995) model, which described market value as a function of earnings and book value of equity. Following the estimation model selection process methodology explained in chapter 5 section 5.2.1.3, the fixed effect model with time variable was selected as the best model.

Table 6.17
Value relevance of derivatives use (2005–2012)

Variable	Predicted sign	Model 6.5	Model 6.6
E	+	2.669***	
BV	+	1.705***	
IS_DERV	+/-		6.183***
AE	+		2.311***
BS_DERV	+/-		-4.436***
ABS	+		1.514***
2006		0.788*	0.645
2007		-0.415	-0.369
2008		-1.161**	-1.100**
2009		-0.440	-0.320
2010		-0.848*	-0.539
2011		-1.605***	-1.150**
2012		0.100	0.371
Intercept		1.991***	2.398***
No of firm years		1638	1335
No of firms		229	206
F stat		102.67***	58.11
R-Square		0.3584	0.3557
rho		0.7679	0.7442

MV is the market value measured three months after financial year end date; E and BV represent earnings and book value of equity at the fiscal year end date respectively; IS_DERV is the financial year end earnings from derivatives; AE is the adjusted earnings (the difference of between earnings and IS_DERV at the financial year end); BS_DERV is the book value of net derivatives fair values as at the financial year end; ABS is the adjusted book value (the difference of between book value and BS_DERV at the financial year end); also SD column represents the standard deviation. Additionally all variables have been deflated by number of shares (NOSH).

Table 6.17 model 6.5 (basic model for all firms) results show that both earnings and book value of equity are positively and highly significantly related to market value (at 1% level of significance). The purpose of model 6.6 is to examine the value relevance of accounting values related to derivatives. The overall R-squared of the estimation shows that 35.6% of variation in dependent variables is explained by variation in the independent variables of the model. Furthermore, the model 6.6 results show that derivatives-related accounting values integrated in the income statement positively and significantly related to market value at 1% level of significance, while derivative fair values in the balance sheet negatively (at 1% level of significance) associated with market value. Additionally, both adjusted earnings and adjusted book value of equity showed a statistically significant (1% level) positive relationship with market value.

Table 6.17 model 6.6 results suggest that income generated from derivative transactions are associated with value creation. Nevertheless, the model 6.6 coefficient on the balance sheet derivative fair values indicates that accounting information in the balance sheet contributes negatively to the market value of a firm. One of the interpretations of the negative coefficient is that it may capture the credit and other risks attached in an active unrealised derivative contract; hence it may impact negatively on firm value.

6.5.1.4 Analysis and results - value relevance of derivative instrument usage

Different derivative instruments were designed to mitigate different types of risk (for example interest rate swaps are designed to mitigate interest rate risk). The primary purpose of this section is to carry out a sensitivity analysis using the Ohlson (1995) approach on the contribution of different types of derivative instruments towards the reduction in individual risk exposures that could influence the firm value.

6.5.1.4.1 Basic model - value relevance of derivative instrument usage

In order to establish the value relevance of derivative instrument usage re-run the basic, non-disaggregated Ohlson-based model with base case being no derivative usage (referred as equation 6.3). However as in five firms total derivatives fair values couldn't disaggregate further into instruments level, these firms were dropped from the study.

6.5.1.4.2 Extended model - value relevance of derivative instrument usage

In the extended model, the book value of equity is broken down into six components. They are i) total net fair value of interest rate swaps ii) total net fair value of cross currency swaps iii) total net fair value of forward currency contracts iv) total net fair value of commodity contracts v) total net fair value of remaining derivatives, named as other derivatives vi) adjusted equity defined as book value of equity minus the total of above (i) to (v). Also (i) to (v) scaled by total gross value of firms' assets and liabilities. As we cannot disaggregate the income from derivatives into their original instrument type as reporting these figures is not mandatory and majority of firms decided not to do so, income from derivatives is recorded as IS_DERV_{it}.

Hence extended model can be stated as follows.

$$MV_{it} = \propto_0 + \beta_1 IS\_DERV_{it} + \beta_2 AE\_INS_{it} + \beta_3 BS\_DERV\_IRS_{it} + \beta_4 BS\_DERV\_CCS_{it} + \beta_5 BS\_DERV\_FWD_{it} + \beta_6 BS\_DERV\_CMD_{it} + \beta_7 BS\_DERV\_OTR_{it} + \beta_8 ABS_{it} + \varepsilon_{it}$$

- Equation 6.4

Table 6.18 reports the descriptive statistics for the variables used in equation 6.3 and 6.4. All variables have been deflated by the number of shares (NOSH); the mean column shows the mean value of each variable while the SD column represents the standard deviation. Min and Max columns shows the minimum and maximum value of each variable.

Table 6.18
Descriptive statistics: value relevance of different derivative instruments for pooled data during 2005 - 2012

	Mean	SD	Min	Max
Eq 01 - Firm year observations of non- derivative user: 348				
MV	6.541	9.307	0.014	80.824
E	0.258	0.449	-2.719	3.308
BV	2.110	2.886	-0.583	17.494
Eq 02 - Firm year observations of derivative users : 1403				
MV	7.835	9.281	0.076	161.216
IS_DERV	-0.010	0.122	-1.445	1.521
AE_INS	0.414	0.592	-5.639	4.721
BS_DERV_IRS	-0.008	0.110	-1.170	0.764
BS_DERV_CCS	0.004	0.091	-0.989	1.005
BS_DERV_FWD	-0.004	0.058	-1.190	0.348
BS_DERV_CMD	-0.003	0.045	-0.565	0.429
BS_DERV_OTR	-0.008	0.083	-1.609	0.635
ABS_INS	3.115	6.433	-1.125	84.007

Table 6.19 presents the Pearson correlations for derivatives users.

Table 6.19
Pearson Correlation matrix

Variable	MV	IS_DERV	AE_INS	BS_DERV _IRS	BS_DERV _CCS	BS_DERV _FWD	BS_DERV _CMD	BS_DERV _OTR	ABS_INS
MV	1.0000								
IS_DERV	-0.0527	1.0000							
AE_INS	0.6090*	-0.1900*	1.0000						
BS_DERV_IRS	0.0167	0.0466	0.0770*	1.0000					
BS_DERV_CCS	-0.0224	-0.0242	-0.0385	-0.1572*	1.0000				
BS_DERV_FWD	0.0316	0.3465*	0.0133	-0.0436	0.0278	1.0000			
BS_DERV_CMD	-0.2007*	0.1281*	-0.0964*	-0.0038	-0.0132	0.0149	1.0000		
BS_DERV_OTR	-0.0381	0.3390*	-0.0588*	0.0073	-0.0529*	-0.0508	0.0047	1.0000	
ABS_INS	0.5470*	-0.0723*	0.4017*	0.0252	-0.0141	0.0308	-0.0539*	-0.0313	1.0000

MV is the market value measured three months after financial year end date; IS_DERV is the financial year end earnings from derivatives; AE_INS is the adjusted earnings (the difference between earnings and IS_DERV at the financial year end); BS_DERV_*** is the book value of net derivatives fair values of respective derivative instrument at the financial year end; ABS_INS is the adjusted book value (the difference between book value and BS_DERV_*** at the financial year end); All variables have been deflated by number of shares. A star next to the correlation score indicates that the result is statistically significant at 5% level of significance.

Table 6.19 presents the Pearson correlations for derivatives users. The adjusted earnings and adjusted book value of equity are individually positively related to the market value with 5% level of statistical significance. Furthermore, interest rate derivatives and commodity derivatives use are positively and significantly related to market value. In addition, some determinant variables were statistically significant. However, here the intention is to study how these individual components are related to market values using the extended model (equation 6.4).

The primary objective of section 6.5.1.4 is to investigate the value relevance of balance sheet derivative fair value disclosures based on their instrument categories. Results reported in table 6.20 model 6.7 shows that the estimated coefficients on earning and book value of equity are positive and significantly different from zero in derivatives non-users (coefficient = 1.981 and 2.645 respectively and p-value < 0.01 in both cases). Similarly, after isolating the effects of derivative instrument usage in model 6.8, derivative users also had positive and significant coefficient estimates for adjusted earnings and the adjusted book value of equity. With regards to different instruments usage, model 6.8 results show that interest rate derivative coefficients are negatively (p-value < 0.01) related to market value.

Figure 4.6 shows that during the study period Bank of England official interest rates decreased from over 5% to 0.5% and remained at this level. This could be one of the reasons for market considering interest rate swaps usage as a negative factor towards firm value as managing interest rate risk had a low priority during the latter half of the study period. In the case of commodity contracts, the coefficients were negative and highly significant (p-value < 0.01). One explanation for this using the extent of derivative usage results in chapter 4 is that the majority of commodity fair values did not fall in to hedge accounting, therefore commodity derivative users could not benefit from the ability of hedge accounting to reduce earnings volatility. Furthermore, cross currency swaps, forwards and other derivatives variables all had a negative sign. However, the coefficients did not appear to be significant.

Table 6.20
Value relevance of different derivative instrument usage (2005–2012)

Variable	Predicted sign	Model 6.7	Model 6.8
E	+	1.981***	
BV	+	2.645***	
IS_DERV	+/-		5.903***
AE_INS	+		2.248***
BS_DERV_IRS	+/-		-7.583***
BS_DERV_CCS	+/-		-0.979
BS_DERV_FWD	+/-		-4.074
BS_DERV_CMD	+/-		-14.856***
BS_DERV_OTR	+/-		-2.954
ABS_INS	+		1.500***
2006		0.720	0.702
2007		-1.063	-0.326
2008		-2.627***	-1.143**
2009		-1.489*	-0.300
2010		-2.268***	-0.535
2011		-3.227***	-1.178**
2012		-1.245	0.314
Intercept		1.518**	2.379***
No of firm years		303	1343
No of firms		85	207
F stat		44.68***	43.14***
R-Square		0.5866	0.3640
rho		0.7933	0.7393

MV is the market value measured three months after financial year end date; E and BV represent earnings and book value of equity at fiscal year-end date respectively; IS_DERV is the financial year end earnings from derivatives; AE_INS is the adjusted earnings (the difference of between earnings and IS_DERV at the end of financial year); BS_DERV is the book value of net derivatives fair values as at the end of financial year; ABS is the adjusted book value (the difference of between book value and BS_DERV at the end of financial year); also SD column represents the standard deviation. Additionally all variables have been deflated by the number of shares (NOSH).

6.5.2 Value relevance of hedge accounting use - Ohlson (1995) valuation framework

In section 6.5.1 the value relevance of derivatives use was examined using the Ohlson valuation methodology. Using the same approach, section 6.5.2 will investigate the value relevance of hedge accounting use. In the initial part of the analysis it will examine the association between the market value of a firm and its book value of equity and future earnings amongst derivative users. Subsequently it will further disaggregate firms' earnings and the book value of their equity into earnings related to hedge accounting as well as the contribution of hedge accounting fair values towards the book value of equity.

6.5.2.1 Basic model

In order to establish the value relevance of hedging categories the study re-ran the basic, non-disaggregated Ohlson-based model with the base case being derivatives reported as FVTPL (here after referred the equation of this model as equation 6.5). Furthermore, the estimation sample only included firm years containing derivatives.

As the purpose of this section is to examine the value relevance of hedge accounting users and the expectation is hedging accounting users have a higher firm value than non-user firms, the hypothesis can be stated as follows.

There is a positive relationship between firm value and the use of hedge accounting amongst derivative using non-financial firms in the UK.

6.5.2.2 Extended model - for hedge accounting users

In the extended model for hedge accounting users, both earnings and the book value of equity stated in equation 6.5 are further disaggregated into two more components each.

(i) Earnings are disaggregated into earnings related to derivatives accounted for via hedge accounting as well as adjusted earnings; where adjusted earnings are defined as earnings minus earnings related to the hedge accounting of derivatives.

(ii) The book value of equity is disaggregated into two components; the first is total net fair value of hedge-accounted derivatives and adjusted equity; where adjusted equity is the book value of equity minus the total gross fair value of derivatives reported as hedge accounting.

Therefore the extended model can be stated as follows.

$MV_{it} = \propto_0 + \beta_1 IS\_HEDGE_{it} + \beta_2 AE\_HEDGE_{it} + \beta_3 BS\_HEDGE_{it} + \beta_4 ABS\_HEDGE_{it} + \varepsilon_{it}$ - Equation 6.6

Table 6.21 reports the descriptive statistics for the variables used in equation 6.5, equation 6.6.

Table 6.21

Descriptive statistics of variables for pooled data during 2005 - 2012

	Mean	SD	Min	Max
Eq 5 - Firm year observations of FVTPL user firms :919				
MV	8.257	9.986	0.077	161.216
E	0.431	0.657	-5.618	4.745
BV	3.151	5.741	-1.216	83.986
Eq 6 - Firm year observations of hedge accounting users : 1213				
MV	8.189	9.612	0.077	161.216
IS_HEDGE	-0.011	0.131	-1.445	1.521
AE_HEDGE	0.448	0.619	-5.639	4.721
BS_HEDGE	-0.005	0.147	-1.098	0.964
ABS_HEDGE	3.318	6.858	-1.205	84.017

IS_HEDGE is the financial year end earnings from hedged derivatives; AE_HEDGE is the adjusted earnings (the difference of between earnings and IS_HEDGE at the end of the financial year); BS_HEDGE is the book value of net derivatives fair values in a hedging relationship as at the end of the financial year; ABS_HEDGE is the adjusted book value (the difference of between book value of equity and BS_HEDGE at the end of the financial year); SD column represents the standard deviation. All variables have been deflated by the number of shares (NOSH). Additionally, the estimation sample only included firm years that have derivatives. Table 6.21 presents the Pearson correlations for hedge accounting users firms.

Table 6.22 presents the Pearson correlations for hedge accounting users firms.

Table 6.22
Pearson Correlation matrix

Variable	MV	IS_HEDGE	AE_HEDGE	BS_HEDGE	ABS_HEDGE
MV	1.0000				
IS_HEDGE	-0.0506	1.0000			
AE_HEDGE	0.6052*	-0.1919*	1.0000		
BS_HEDGE	-0.0367	0.0331	0.0506	1.0000	
ABS_HEDGE	0.5474*	-0.0623*	0.3973*	0.0140	1.0000

A star next to the correlation score indicates that the result is statistically significant at 5% level of significance.

The adjusted earnings and adjusted book value of equity are individually positively related to the market value with a 5% level of statistical significance, while income from derivatives in a hedging relationship and the net book value of derivatives reported as hedged are negatively related to market value. Furthermore, the results suggest that different hedges are related to each other; these relationships are explored further in section 6.5.2.4.

6.5.2.3 Analysis and results - value relevance of hedge accounting usage

Equation 6.1 in section 6.5.1.1 has been used as the base model to estimate an approximation of the Ohlson (1995) model, which described market value as a function of earnings and the book value of equity. As the purpose of this section is to examine the impact of hedge accounting on the market value of firms, the full data set has been reduced to only derivative users based on the ability to correctly disaggregate their fair values into hedging categories. The fixed effect model with a time variable is selected as the best fitting model following the estimation model selection process explained in chapter 5, section 5.2.1.

Table 6.23 model 6.9 shows the regression results for FVTPL user firms. It shows results consistent with Ohlson (1995); both earnings and the book value of equity are positively related to market value at 1% level of significance. Table 6.23 model 6.10 examines the contribution of hedge accounting values towards firm value. The overall R-squared of the estimation shows that 35% of the variation in dependent variables is explained by variation in the independent variables of the model. Also, both adjusted earnings and adjusted book value of equity are statistically significant at 1% and in a positive relationship with the market value of a firm.

Table 6.23
Value relevance of hedge accounting use (2005–2012)

Variable	Predicted sign	Model 6.9	Model 6.10
E	+	1.822***	
BV	+	1.472***	
IS_HEDGE	+/-		3.611***
AE_HEDGE	+		2.059***
BS_HEDGE	+/-		-5.617***
ABS_HEDGE	+		1.518***
2006		0.770	0.725
2007		0.081	-0.324
2008		-1.088*	-1.089**
2009		-0.138	-0.124
2010		-0.165	-0.580
2011		-0.927	-1.238**
2012		0.648	0.204
Intercept		2.861***	2.470***
No of firm years		868	1163
No of firms		163	187
F stat		44.51***	50.12***
R-Square		0.4537	0.3511
rho		0.8624	0.7373

MV is the market value measured three months after financial year end date; E and BV represent earnings and the book value of equity at fiscal year-end date respectively; IS_HEDGE is the financial year end earnings from derivatives; AE is the adjusted earnings (the difference of between earnings and IS_HEDGE at the end of the financial year); BS_HEDGE is the book value of net derivatives fair values as at the end of the financial year reported as hedge accounted; ABS is the adjusted book value (the difference of between book value of equity and BS_HEDGE at the end of the financial year); SD column represents the standard deviation. All variables have been deflated by the number of shares (NOSH).

Table 6.23 model 6.10 results show that the net gain or loss in the income statement from derivative hedging is statistically significant at the level of 1% and positively related to firm value; meaning that the outcome is that the realised hedging positions are value creators. Nevertheless, reported fair values of hedged derivatives in the balance sheet are in fact negatively, at 1% level of significance, associated with the market value of a firm. This suggests that irrespective of whether a derivative contract is being hedged, and hedge accounting has been used to reflect a firm's intentions, the market is still sceptical about its final outcome as market cannot accurately predict until the time of realisation; hence they have a negative impact on firm value.

Earnings volatility is likely to give rise to financial distress (Asquith *et al*., 2005). Hence realised income from hedge-accounted derivatives (i.e. IS_HEDGE in model 6.10), reduced earnings volatility leading to less expected financial distress cost, therefore the market gave a higher valuation to these firms. Furthermore Barth *et al*., (1998) and Collins and Kothari (1989) argued that financially distressed firms give higher importance to cash flows and lower importance to income statements; that therefore decreases the value relevance of earnings and increases the value relevance of equity, as investors transfer to equity. The model 6.10 findings above suggest that using hedge accounting reduced the cash flow volatility, hence investors gave a higher value relevance to derivative earnings and decreased value relevance to derivatives reported in the balance sheet.

6.5.2.4 Value relevance of fair value, cash flow and net investment hedge usage

6.5.2.4.1 Basic model

This section will focus on investigating the value relevance of different hedging categories based on the Ohlson (1995) valuation methodology. Similar to section 6.5.2.1, this has been carried out in two stages. In stage one, a basic model has been used to examine the relationship between market value (dependent variable) and firm earnings and the book value of equity (independent variables) with FVTPL being the base case. Therefore basic model can be stated as follows.

$$MV_{it} = \propto_0 + \beta_1 E_{it} + \beta_2 BV_{it} + \varepsilon_{it} \qquad \text{Equation 6.7}$$

MV_{it} is the market value of firm i at time t, t being the 3 months after the financial year end date for each firm. E_{it} is the earnings of firm i at financial year end date. BV_{it} is the book value of equity of firm i fiscal year end date. Furthermore an error term ε_{it} included in the model to capture the impact of omitted variables.

6.5.2.4.2 Extended model - value relevance of different hedging categories

Here in the extended model book value of equity decomposed into 4 components; first three being the derivative usage belong to fair value hedge,cash flow hedge and net investment hedge usage, respectively. Final is the adjusted book value of equity defined as book value of equity minus the total of FV,CF and NI hedge usage. Also gross FV,CF and NI hedge fair values scaled by total gross value of firms' assets and liabilities. Due to inability to accurately disaggregate the income from derivatives into their originated hedging category, income from derivatives recorded as IS_DERN_{it}.

Extended model is stated below

$$MV_{it} = \propto_0 + \beta_1 IS\_HEDGE_{it} + \beta_2 AE_{it} + \beta_3 BS\_FV\_HEDGE_{it} + \beta_4 BS\_CF\_HEDGE_{it} + \beta_5 BS\_NI\_HEDGE_{it} + \beta_6 ABS_{it} + \varepsilon_{it} \quad \text{- Equation 6.8}$$

Table 6.24 shows the descriptive statistics for variables used in equation 6.7 and equation 6.8.

Table 6.24
Descriptive statistics: value relevance of different hedging categories: pooled data during 2005 - 2012

	Mean	SD	Min	Max
Eq 7 - Firm year observations of FVTPL user firms : 919				
MV	8.257	9.986	0.077	161.216
E	0.431	0.657	-5.618	4.745
BV	3.151	5.741	-1.216	83.986
Eq 8 - Firm year observations of hedge accounting users : 1213				
MV	8.189	9.612	0.077	161.216
IS_HEDGE	-.0109	0.131	-1.445	1.521
AE_INS	0.448	0.619	-5.639	4.721
BS_DERV_FVH	0.024	0.087	-0.267	1.005
BS_DERV_CFH	-0.021	0.114	-1.098	0.635
BS_DERV_NIH	-0.008	0.039	-0.503	0.115
ABS_INS	3.318	6.858	-1.205	84.017

All variables in table 6.24 have been deflated by the number of shares (NOSH); the mean column shows the mean value of each variable and SD column represents the standard deviation.

Table 6.25 presents the Pearson correlations for the variables used to examine the value relevance of hedging categories. It shows that the adjusted earnings and adjusted book value of equity are positively related to the market value with 5% level of statistical significance. In addition to that, cash flow hedge use also positively and significantly related to market value. Fair value hedge use and net investment hedge use showed positive and negative relationship with firm value, respectively. However both of these variables were not significant.

The main aim of section 6.5.2.4.2 is to investigate the value relevance of hedging categories amongst derivative users using balance sheet derivatives fair value disclosures. Table 6.26 model 6.11 presents the results of the equation 6.5, which examined the association between earnings and the book value of equity with firm value with the base case being FVTPL use. It shows that the coefficients for earnings and the book value of equity from the use of FVTPL derivatives are positive and significant at 0.01% level.

Table 6.25 presents the Pearson correlations for derivatives users.

Table 6.25
Pearson Correlation matrix

Variable	MV	IS_DERV	AE_INS	BS_DERV_FVH	BS_DERV_CFH	BS_DERV_NIH	ABS_INS
MV	1.0000						
IS_HEDGE	-0.0506	1.0000					
AE_INS	0.6052*	-0.1919*	1.0000				
BS_DERV_FVH	0.1573*	-0.1208*	0.1608*	1.0000			
BS_DERV_CFH	-0.1558*	0.1183*	-0.0432	-0.0042	1.0000		
BS_DERV_NIH	-0.0348	0.0476	-0.0401	-0.0243	-0.0167	1.0000	
ABS_INS	0.5474*	-0.0623*	0.3973*	0.1418*	-0.0486	-0.1191*	1.0000

MV is the market value measured three months after financial year end date; E and BV represent earnings and book value of equity at the fiscal year-end date respectively; IS_HEDGE is the financial year end earnings from derivatives; AE_INS is the adjusted earnings (the difference of between earnings and IS_HEDGE at the end of financial year); BS_DERV_**H is the book value of net derivatives fair values as at the end of financial year reported as each hedging category; ABS_INS is the adjusted book value (the difference of between book value of equity and the total of BS_DERV_**H at the end of financial year); SD column represents the standard deviation. All variables have been deflated by the number of shares (NOSH).

The test results of the effects of model 6.12, which examines the usage of fair value, cash flow and net investment hedges on firm value, show that both cash flow and net investment hedges are negatively related to firm value (both variables significant at 1% level of significance). However, the coefficients of FV hedge usage showed a negative sign; nevertheless the p-value was not significant.

Table 6.26

Value relevance of different derivative hedging categories (2005–2012)

Variable	Predicted sign	Model 6.11	Model 6.12
E	+	1.822***	
BV	+	1.472***	
IS_DERV	+/-		3.917***
AE_INS	+		2.065***
BS_DERV_FVH	+/-		-1.089
BS_DERV_CFH	+/-		-6.363***
BS_DERV_NIH	+/-		-16.050***
ABS_INS	+		1.531***
2006		0.770	0.774
2007		0.081	-0.364
2008		-1.088*	-1.499**
2009		-0.138	-0.355
2010		-0.165	-0.810
2011		-0.927	-1.468**
2012		0.648	-0.003
Intercept		2.861***	2.397***
No of firm years		868	1163
No of firms		163	187
F stat		44.51***	43.55***
R-Square		0.4537	0.3531
rho		0.8624	0.7439

MV is the market value measured three months after financial year end date; E and BV represent earnings and book value of equity at the fiscal year-end date respectively; IS_HEDGE is the financial year end earnings from derivatives; AE_INS is the adjusted earnings (the difference of between earnings and IS_HEDGE at the end of the financial year); BS_DERV_**H is the book value of net derivatives fair values as at the end of the financial year reported as each hedging category; ABS_INS is the adjusted book value (the difference of between book value of equity and the total of BS_DERV_**H at the end of the financial year);

The net investment hedge findings above are consistent with the findings in section 6.4.5.3, where the coefficient value showed a negative sign with a 1% significance level. Additionally in section 6.4.5.3. cash flow hedge usage showed a positive sign; however, the coefficients were not significant. Nevertheless, the Ohlson (1995) approach gave the cash flow hedge coefficient a negative sign, also significant at 1% level of significance.

In both Tobin's Q and the Ohlson (1995) approach the fair value hedge showed a negative sign. Nevertheless, the coefficients were not significant. In summary, model 6.12 results suggests that cash flow and net investment hedge usage have an impact on firm value.

Table 6.27 summerises the results of sensitivity analysis carried out using Ohlson (1995) model.

Table 6.27
Summary – Ohlson (1995) model results

"Ohlson" regressions of MV as dep. var.	Predicted sign	Table 6.17	Table 6.17	Table 6.20	Table 6.23	Table 6.26
		all firms	all users	all users	hedge users	hedge users
		fixed effects	fixed effects	fixed effects	fixed effects	fixed effects
Earnings total	+	+ sig				
BV total	+	+ sig				
Earnings deriv	+/-		+ sig	+ sig	+ sig	+ sig
Earnings other	+		+ sig	+ sig	+ sig	+ sig
BV deriv	+/-		- sig		- sig	
BV deriv int swaps	+/-			+ sig		
BV deriv fx swaps	+/-			- sig		
BV deriv fx fwd	+/-			- sig		
BV deriv comm contracts	+/-			- sig		
BV deriv other	+/-			+ sig		
BV FV hedge	+/-					
BV CF hedge	+/-					- sig
BV NI hedge	+/-					- sig
BV other	+		+ sig	+ sig	+ sig	+ sig

6.6 Comparison of findings with literature

This chapter's findings complement some of the finding of Panaretou (2014) who examined the value relevance of derivatives use amongst FTSE 350 non-financials from 2003 to 2010. His findings suggest a positive hedging premium for foreign currency derivatives users while a negative for commodity derivative users and weak evidence that interest rate hedging increases firm value; all of these findings are consistent with the current chapter's results. Panaretou's (2014) study documented 86.88% hedging activity. In comparison to previous UK-related studies this percentage is higher (and similar to the findings in chapter 4). He stated that "the extent of hedging and the hedging horizon have an impact on the hedging premium, whereas other risk management activities do not significantly influence the value of the firm".

Furthermore, he found several possible reasons behind the low level of hedging premium. One possible explanation was during the period of the economic downturn hedging benefits, accompanied by the reduction in corporate tax and under-investment cost, could be less noticeable; hence a lower hedging premium. Faulkender (2005) suggested that the interest rate exposure of the firm is primarily driven by the slope of the yield curve at the time of the debt being issued; hence the effects of the interest rate derivatives usage on firm value depend on the purpose of using derivatives (either for hedging or speculation). Similar to Panaretou (2014), positive coefficients amongst the firm value and use of interest rate derivatives suggests that firms use derivatives mainly for hedging purposes, leading to a lower hedging premium.

The current study's findings show a negative association between commodity derivatives use and firm value. Literature provides mixed results on the value relevance of commodity hedging. While Carter *et al*. (2006) provided a positive contribution from commodity hedging on firm value, Nelson, Moffitt, and Affleck-Graves (2005) provided contrary evidence. Jin and Jorion (2006) suggested that despite oil and gas hedging reducing the sensitivity of oil and gas on share prices in fact it does not affect the market value of the firm. One possible explanation for the negative association between commodity derivatives use and firm value is that the motivation behind using commodity derivatives is for reasons other than value maximization (Tufano, 1996; Panaretou, 2014). As an example amongst gold miners, derivatives use predominantly reflects managerial risk aversion; hence they could actually destroy firm value in the case of costly risk management (Tufano, 1996).

Additionally, several studies reported mixed or negative results with regards to derivatives use and firm value. Using a global sample Allayannis et al (2012) reported an increase in firm value when foreign currency derivatives were in use, however insignificant results with interest rate derivatives use. They suggested that the level of internal and external corporate governance has an interaction between derivatives use and the value of firms. Fauver and Naranjo (2010) documented negative valuation effects for US derivative user firms that are less transparent, face greater agency costs, have larger information asymmetry problems, have weaker corporate governance, and have overall poorer monitoring. Amongst French firms Belghitar *et al*. (2013) found that derivatives are effective in reducing overall foreign currency exposure; nevertheless, there was no significant effect on firm value in the total sample or when it was broken down by derivative instrument or exposure type. They suggested that ineffectiveness in the risk management programme, inadequate gains from hedging to cover the costs in physical, financial and human resources required for a hedging strategy and possible speculative derivative trading losses were likely reasons for no significant effect on firm value. Moreover, Khediri (2010) provided further evidence on French firms supporting the argument that the decision to use derivatives has no effect on firm valuation while the extent of derivatives use can even lower firm value. Therefore, investors do not assign a premium value to derivatives use.

Jin and Jorion (2006) also found that even though hedging reduces the firm’s share price sensitivity to oil and gas prices amongst US oil and gas producers it does not affect the market value of firms. They stated that the hedging premium depends on the types of risks to which the firm is exposed and if it’s easy to identify and easy to hedge by the investors, then hedging premium should fade away. Furthermore, Smith and Stulz (1985) in their managerial compensation hypothesis stated that managerial compensation schemes may provide incentives for hedging that are not valued by shareholders as their expected utility mostly depends on accounting earnings and in the case of expected utility being a concave function of accounting earnings, then managers may hedge even if hedging has no influence on firm value.

6.7 Conclusion

The current chapter examines the effect of using derivatives on firm value amongst UK non-financial firms listed in the FTSE 350 Index between 2005 and 2012. Initially, the study focused on whether use of derivatives influenced firm value. The results suggest that firms using derivatives are valued more highly compared to non-users, though the results are not statistically significant. Nevertheless, the results are of the expected sign. Most previous studies examined whether hedging activity adds value to a firm based solely on the decision to use derivatives. However, the current study extended this to examine the extent of the impact of using derivatives on firm value using reported financial year end derivatives fair value as a measure of hedging. Thereafter, this study specifically looked at how different derivative instruments (i.e. interest rate swaps, cross currency swaps, forward currency contracts, commodity contracts and other derivatives) contribute to firm value. The study also focused on the effects on firm value of reporting derivatives as fair value hedges, cash flow hedges or net investment hedges.

In the latter part of the study, a sensitivity analysis has been carried out using the Ohlson (1995) valuation approach. One of the main advantages of using the Ohlson (1995) model is that it does not rely on a concept of permanent earnings or asset and liability values, but is expressed in terms of accounting earnings and equity book value. Consequently, “empirical implementations using the Ohlson model do not require specifying a link between accounting amounts and economic constructs such as permanent earnings” (Barth et al., 2001). Tobin’s Q approach and Ohlson’s approach produced results consistent with the main analysis, increasing the reliability of the findings.

One of the most important contributions of this chapter is that it extended the investigation not only for hedging activities, but also the impact on firm value of applying hedge accounting. Further, another immediate input of this chapter is that it highlights the increasing importance of fair value as an accounting measurement attribute and its potential contribution to decision relevance based on its disaggregation.

Theoretical research on derivatives so far has been relatively silent on the properties and desirability of fair value as a measurement of its value relevance. The findings of this chapter contribute to the existing body of research on theoretical assumptions and hypotheses underlying the fair value paradigm under realistic settings. By doing so it contributes to assessing usefulness of IFRS financial reporting on decision making.

Chapter 7: The extent to which analysts' reports reference derivatives usage by firms

7.1 Introduction

"Derivatives contracts, the markets in which they trade, and requisite financial reporting are notoriously complex" (Chang, Donohoe and Sougiannis, 2016). Kawaller (2004) found that many derivative users do not apply accounting standards correctly or consistently, making it nearly impossible for users of financial statements to assess a firm's derivatives and hedging activity from its annual reports. It is generally accepted that financial statement information should provide information useful for market participants for their decision making (Jiao, Koning, Mertens and Roosenboom, 2012) and financial analysts can be identified as sophisticated users of financial statements as well as intermediaries of financial markets (Schipper, 1991) interpreting high quality information reported by firms. They use financial statements as a major contributor to their research in order to provide accurate forecasts and recommendations (Jiao *et al.*, 2012). Furthermore, analysts have long been viewed as financial experts who are less likely to misinterpret financial complex information (Ramnath *et al.*, 2008; Jiao *et al*., 2012).

Nevertheless Ryan (2007) questioned analysts' understanding of the complex nature of derivatives. Some evidence even suggested that analysts often follow recent events and news about firms rather than accounting numbers (Altinkilic, Balashov and Hansen, 2013). Furthermore, some studies found the existence of herding effects amongst analysts where their predictions were based on a better-known analyst's recommendations (Welch, 2000; Clement and Tse, 2005; Jegadeesh and Kim, 2010). Even though analysts' predictions should be based on their ability to obtain and process information accurately (Ramnath *et al*., 2008) analysts routinely misjudge the earnings implications of firms' derivatives activity (Tan *et al*., 2011; Chang *et al*., 2016). The purpose of this chapter is to examine the extent to which analysts, so-called expert users of financial statements, reference significant derivatives information in financial statements. The chapter uses a novel approach. It focuses on firms which enjoyed the highest proportionate gains from derivatives use and those which suffered the highest proportionate losses from derivatives use – that is, the extreme cases; and looks at the extent of derivatives-related comment in analysts' reports on those firms.

7.2 Research design and development of the methodology

Although there is a substantial amount of literature on financial analysts' forecast-related topics and evidence on the information content of text in analyst reports (e.g. Huang, Zang and Zheng, 2014; Luo, Wang and Raithel, 2015; Ittner and Michels, 2017), relatively few studies concentrated on how derivatives disclosure and reporting is reflected in analysts' written reports. As financial statements act as an important source of information for analysts (Schipper, 1991; Barron, Byard, & Kim, 2002; Barker & Imam, 2008; Jiao, 2012), this study attempts to examine the analysts' understanding of disclosed financial information with regards to derivatives. This paper is one of the first to focus on this area; therefore, it proposed a novel approach.

7.2.1 Sample period selection process

The next step of the research design is to select an appropriate sample period. The basis of selecting analyst reports for analysis is selecting all available analyst reports rather than limiting the selection to the most detailed research reports or only to reports generated by the big analyst firms. The Investext database contains a wide range of reports, including conference call minutes, earning presentations as well as analyst reports on equities; the length of a report varies from just a few pages to over 100 pages. Furthermore, analysts commonly produce multiple reports for a particular firm in the same year, also more than one analyst working for the same employer covered a particular firm. Therefore, selecting a manageable sample that would provide comprehensive indepth analysis is important. As such the analysis included analyst reports for the financial year 2012 from all investment houses with no particular firm dominates the findings. A pilot study was conducted reviewing a sample of reports, before the main analysis was undertaken.

2012 was selected as the targeted year as: (i) 2012 being the most recent conventional year in the determinants/value relevance study; (ii) also 2012 being the furthest from the introduction on IFRS, so minimising the impact of confounding effects such as learning effects after the adoption of IFRS, late IFRS adopters or even panic and a negative attitude towards the word "derivative". Considering the fact that different firms have different financial year end dates, as regards to sample completeness, analyst reports in the window eight months prior to the financial year end date and six months after the financial year end for all non-financial firms was selected as the sample. The rationale behind selecting eight months prior to the financial year end date as the sample period is that the study expects analyst reports to contain by the way of analysis, or mention, of the implications of a particular event that could lead to an abnormal gain or loss in the financial accounts of the subsequent period.

7.2.2 Data sources

Data for this chapter was obtained from three different sources. As this study focuses on derivative usage amongst the UK's 350 largest non-financial firms listed on the London Stock Exchange in 2012, I collected and analysed financial statement data gathered from annual reports for fiscal year 2012 for the full investigation. In that year 79 firms were listed as FTSE 100 non-financial firms. From this 74 firms reported derivatives fair values in their annual report. In addition to that, there were a further 159 non-financial firms listed as FTSE 250 firms out of which 114 firms reported derivative fair values, giving a grand total of 188 firms as derivatives users for fiscal 2012. Furthermore, hand collected derivatives fair value data from the balance sheet was disaggregated, based on (a) the IAS 39 hedging category and (b) the type of instrument using notes to the accounts section and further disclosure. Additionally, derivatives-related income statement and OCI statement data was also hand collected. The second set of data consists of proxies for empirical analysis and were collected from DataStream. In order to provide direct evidence on analysts' discussion of derivatives and their engagement in interpreting derivatives accounting disclosure, analyst reports were obtained from Thomson Reuter's Investext

Database. This approach enables explicit identification of whether an analyst report contains discovery or interpretation of derivatives-related disclosure (Section 7.2.4 *Variable Construction* provides more details on the data construction process).

7.2.3 Key word selection process

The following words were selected as the key words and searches were carried out manually on the pdf version of analyst reports.

(i) derivativ*
(ii) Hedg*
(iii) financial risk
(iv) market risk
(v) interest rate risk
(vi) forward exchange
(vii) exchange rate risk
(viii) commodity risk

Note: * represents a character that will match any character or sequence of characters in a search used to identify all records of these words and their deviations.

7.2.4 Value change impact (VCI) score and sample firm selection process

7.2.4.1 Value change impact (VCI)

In addition to selecting an appropriate sample period and key words next stage of the selection process is select sample firms. The key element of the sample firm selection process is that it captures firms that are involved in extreme cases of abnormal gains or losses with derivatives compared to other non-financial firms in the FTSE 350 index during 2012. Due to the lack of comparative studies this study introduces a novel idea of ‘value change impact of derivatives’.

Therefore value change impact is defined as follows:

- FV hedges: change in value of FV hedging instruments net of change in value of hedged item via the income statement.

- CF hedges: change in value of CF hedging instruments via the income statement and the statement of comprehensive income.

- FVTPL: change in value of FVTPL derivatives via the income statement.

- All derivatives: The aggregate of the foregoing.

The underlying principle behind value change impact is that it will capture the most extreme cases of derivative outcome to the income statement compared to a firm producing average results from hedging activities. This has been approached by calculation of a scaled deviation measure, simply (value – mean)/SD (referred to as ‘z-statistic’ for the remainder of this chapter). In order to make the measure comparable between firms, the outcome from derivative activities as it affects the income statement is deflated by earnings. The deflator, earnings, will be taken as a positive for each firm whether or not the firm made a profit or a loss, therefore a positive deflator in every case has been employed (i.e. a negative value for “Value change impact of relevant derivatives, scaled by earnings” means a negative impact on the firm’s earnings and net assets). The classification of value change impact is calculated separately for each hedging category, and in aggregate. In can take positive, zero or negative values.

7.2.4.2 Sample selection process

The following procedure has been used for the sample firm selection for fiscal year 2012.

a) Those firms with the largest proportional positive earnings impact of using derivatives in 2012:

- In table 7.1 shaded in yellow or blue, being the ten firms with the highest VCI in the FV hedge, CF hedge or FVTPL categories, or in aggregate. Furthermore, each firm is shaded only once; and shading started from the right (e.g., Centrica is highlighted in the “All derivatives” column so therefore does not need to be highlighted again in the “FV hedges” or “FVTPL” columns). This gives 26 firms … “list A”

b) Those firms with the largest proportional negative earnings impact from using derivatives in 2012:

- In table 7.1 shaded in yellow or blue, being the ten firms with the lowest VCI in the FV hedge, CF hedge or FVTPL categories, or in aggregate. Each firm is shaded only once; and shading started from the right. This gives 25 firms … “list B”

The blue shading of firms in list A and list B denote firms which appear in both lists. A particular firm cannot be in both lists, based on any one category. However, in the case of different categories it is possible as a firm could be a ‘winner’ in one category, and another a ‘loser’. (e.g., BHP Billiton is a winner in FVTPL category, however a loser in CF hedges). To avoid potentially ambiguous cases, these firms were dropped – leaving lists of unambiguous “top winners” and “worst losers” via derivatives.

Table 7.1 shows the results of value change impact of derivatives. Each column in table 7.1 will only consider firms which use the pertinent hedge type; and value change impact for each column will be based on its hedge category.

Table 7.1
Value change impact of derivatives

	FV hedges	VCI (FV hedges)	CF hedges	VCI (CF hedges)	FVTPL	VCI (FVTPL)	All derivatives	VCI (All derivatives)
Mean	0.00000193		0.0001525		0.00000838		0.0001249	
Median	0		-0.00000064		0.00000000		-0.00000073	
Maximum	0.000156		0.025		0.00163620		0.025	
Minimum	-0.0000551		-0.0036667		-0.00135530		-0.0038333	
Standard deviation	0.0000229		0.0021445		0.0002672		0.0019174	
Skewness	4.645862		10.92557000		2.230116		12.04307	
Kurtosis	33.539		127.090		28.599		156.751	
N	65		144		116		183	
Highest 15 z-stat firms	BHP Billiton Plc	1,353,711.71	BP Plc	683,609.16	Rolls-Royce	2,776,946.08	BP Plc	566,391.92
	National Grid Plc	742,357.99	easyJet Plc	50,827.63	Centrica Plc	1,815,119.73	Rolls-Royce	384,896.15
	Centrica Plc	393,013.02	BT Group Plc	48,962.39	BHP Billiton Plc	1,148,952.06	Centrica Plc	243,558.92
	BBA Aviation	301,309.96	BSkyB Group Plc	46,164.54	National Grid Plc	890,718.53	National Grid Plc	113,174.02
	Experian Plc	262,008.65	Tesco Plc	39,169.90	Evraz Plc	662,425.12	Evraz Plc	92,312.44
	CRH Plc	218,340.53	Xstrata Plc	38,703.59	Fresnillo Plc	463,589.04	GKN Plc	67,800.08
	Inchcape Plc	209,606.90	Reed Elsevier Plc	32,641.57	GKN Plc	437,874.22	Fresnillo Plc	67,693.17
	UBM Plc	161,571.97	SSE Plc	21,450.15	AstraZeneca Plc	419,161.65	BSkyB Group Plc	61,541.61
	Pennon Group Plc	148,471.53	Glencore Xstrata	18,185.99	Rio Tinto Plc	325,598.77	AstraZeneca Plc	58,412.37
	SABMiller Plc	131,004.28	IAG SA	16,787.06	SABMiller Plc	213,323.32	BT Group Plc	49,024.66
	Kingfisher Plc	87336.16	Marks & Spencer	15667.92	British American Tobacco	168413.14	easyJet Plc	44330.8
	Tate & Lyle Plc	43668.04	Premier Oil Plc	11750.92	Imperial Tobacco Group	123502.96	Xstrata Plc	41201.56
	DS Smith Plc	30567.6	Essar Energy Plc	10072.21	Meggitt Plc	99176.62	Reed Elsevier Plc	37029.25
	WPP Plc	26200.79	J Sainsbury Plc	8393.49	BSkyB Group Plc	74850.27	Tesco Plc	29727.69
	Whitbread Plc	17467.16	Sports Direct Inter	7184.82	Cobham Plc	54266.44	SABMiller Plc	27119.99
Lowest 15 z-stat firms	BSkyB Group Plc	-43,668.21	FirstGroup Plc	-15,668.06	Capita Plc	-52,020.99	Greene King Plc	-20,027.19

Pearson Plc	-43,668.21	Rexam Plc	-16,320.89	Tesco Plc	-52,395.24	Inchcape Plc	-21,539.65
British American Tobacco	-87,336.33	National Grid Plc	-17,719.82	easyJet Plc	-89,820.39	TUI Travel Plc	-22,947.81
Glencore Xstrata	-131,004.45	Greene King Plc	-17,906.34	Severn Trent Plc	-95,434.16	Rexam Plc	-25,033.97
Severn Trent Plc	-170,305.76	Severn Trent Plc	-18,186.13	United Utilities Plc	-106,661.71	Marston's Plc	-29,414.90
Xstrata Plc	-174,672.57	TUI Travel Plc	-19,585.06	Pearson Plc	-108,532.97	Severn Trent Plc	-35,673.37
Compass Group Plc	-218,340.70	Inchcape Plc	-21,496.92	Vedanta Resources	-112,275.48	Anglo American Plc	-39,637.07
United Utilities Plc	-240,174.76	Marston's Plc	-25,507.18	Afren Plc	-116,018.00	Tullow Oil Plc	-46,521.40
J Sainsbury Plc	-305,676.94	Vedanta Resources	-28,211.78	Anglo American Plc	-194,610.81	Vedanta Resources	-47,199.40
Rio Tinto Plc	-524,017.55	Rio Tinto Plc	-28,444.93	Marks & Spencer	-263,847.34	Mitchells & Butlers	-53,718.64
Tesco Plc	-567,685.67	Tullow Oil Plc	-41,594.85	Vodafone Group Plc	-471,556.92	Unilever Plc	-74,580.23
Rexam Plc	-829,694.41	Mitchells & Butlers	-48,029.91	SSE Plc	-747,380.27	SSE Plc	-80,160.70
Anglo American Plc	-1,048,035.02	Unilever Plc	-65,749.66	BP Plc	-1,418,413.21	Vodafone Group Plc	-81,881.78
Vodafone Group Plc	-1,353,711.87	Royal Dutch Shell	-117,043.67	Experian Plc	-2,144,461.12	Experian Plc	-295,713.01
Royal Dutch Shell	-9,170,305.76	BHP Billiton Plc	-149,219.00	Royal Dutch Shell	-3,383,233.56	Royal Dutch Shell	-711,901.60

The above process leaves a yellow shaded sub-sample presented in table 7.2. From this list, firms listed in list A and list B can be identified as extreme derivative-winner and -loser firms in 2012.

Table 7.2
Summary – Number of extreme derivative-winner and -loser firms for year 2012

Category list	**2012 firm-years**
List A - Highest largest (proportional) positive earnings impact	17
List B - Those firms with the largest (proportional) negative earnings impact	17
Total	34

7.2.5 Material selection process

The next stage of the research design involves selecting an appropriate material type. In addition to analyst reports, the Investext database produce earnings conference call transcripts obtained from Thomson Reuter's StreetEvents database, also transcripts from earning presentations. Mayew, Sharp and Venkatachalam (2013) found that that annual earnings for forecasts issued immediately after a conference call are both more timely and accurate for participating analysts relative to non-participating analysts. Conference call transcripts as well as earning presentations cannot be recognised as written research. Whilst they might have some capital market effect, it is possible or even probable that any movement in stock price stems from the non-verbal messaging as opposed to the verbal (e.g. Mayew *et al*., 2013; Davis *et al*., 2015; Allee *et al*., 2015). Furthermore, it is not uncommon in analyst studies to divide between written and spoken research. In addition to that, analysts' reports are relatively standard in terms of formats, font sizes and layouts, hence relatively consistent and are regularly released/read documents, which should summarise all that the analysts know and deem to be important. Due to these reasons equity research reports produced by analysts have been selected as the targeted material type.

7.2.6 Selection process for meaningful/non-meaningful mentions

As explained in section 7.2.3 derivatives activity-related words normally can appear in the pro-forma and other disclosure sections of the analyst reports. The following procedure has been carried out therefore to filter meaningful mentions.

- A mention is recognised as 'meaningful' if it refers to hedging, derivatives, anything else in the correct sense and makes a substantive comment.
- A mention categorised as 'not meaningful' if a standard phrase is repeated verbatim in all reports for a given firm by the same analyst.
- A mention is categorised as 'not meaningful' if the reproduction of financial statement tables/figures has no elaboration, comment or added analysis of derivatives/hedging.

- A mention is categorised as 'not meaningful' if the use of a hedging term in the context of financial instrument usage is spurious/incorrect (e.g., some utility firms claim to be hedging if a customer signs up for a fixed-term tariff; some firms recognise vertical integration as hedging; both of these examples can be supported as hedging, however this is outside the focus of this chapter).

Table 7.3 shows some of the mentions recognised as meaningful/not meaningful.

Table 7.3
Examples – Meaningful/Not meaningful mentions in the context of derivatives usage

Examples – Meaningful mentions	
(i)	"The net non-operating gain of $41 million in the first quarter primarily relates to fair value gains on embedded derivatives". (© GlobalData - 13-Feb-2012)
(ii)	"Macro-economic cycles will heavily impact easyJet, despite the defensive nature of its business model. 2) Fuel price volatility: the airline hedges against fuel price risk however we estimate that every $50/mt jet fuel price movement from $1,050/mt impacts PBT by £14m in FY13E (3p per share) while every 1% in revenue per seat represents £40m (8p). 3) Other risks include: USD strength, EUR weakness, capacity ill-discipline in the market, the loss of ancillary revenue momentum, cost-cutting challenges and continued shareholder activism by Stelios Haji-Ioannou". (Credit Suisse – Europe - GLYNN, NEIL, *et al*; 06-Nov-2012)
(iii)	EasyJet operates under a clear set of treasury policies agreed by the Board. The aim of easyJet's hedging policy is to reduce short-term earnings volatility. Therefore easyJet hedges forward, on a rolling basis, between 65% and 85% of the next 12 months anticipated fuel and currency requirements and between 45% and 65% of the following 12 months anticipated requirements" (Datamonitor Independent Research; 19-Mar-2012)
(iv)	"Adjusted figures are before special items and remeasurements, impacting pre-tax profits by -$485m, mainly write-offs and impairments and accelerated depreciation in platinum, mett coal and nickel, together with a loss on non-hedging derivatives on capex in Brazil, (vs +$778m, mainly disposal profits and gains on non-hedging derivatives), and impacting EPS by -$0.38 (+$0.68)" (Charles Stanley & Co., Ltd. - Gidley-Kitchin, Tom, 27-Jul-2012)
Examples – Not meaningful mentions	
(i)	"Macro factors – As an integrated oil & gas company, BP's earnings and cash flow are naturally sensitive to oil and natural gas prices and refining margins. BP does not hedge any of these top line macro exposures" (JPMorgan - Lucas, Frederick, 30-May-2012)[40]
(ii)	"We believe that a continued trend towards vertical integration will drive value as the balance sheet becomes more efficient and financial assets are replaced with physical assets which deliver earnings. There are significant advantages to physical hedging over financial hedging" (Liberum - Nash, Dominic, *et al*; 23-Feb-2012)[41]

[40] This mention categorised as 'not meaningful' as it repeated verbatim in all reports published by this particular analyst.

[41] This mention categorised as 'not meaningful' as the use of a hedging term in the context of financial instrument usage is spurious/incorrect

(iii) "Looking at Glencore's marketing business, we begin with the premise that Glencore's expertise pays off a lot more in inefficient markets characterized by high information asymmetry: markets where it can capitalize on in-house supply chain resources and deep market knowledge. In other words, Glencore's moat manifests most in areas where its information edge is greatest and its ability to execute is superior. The advantage can be particularly acute in commodities with less-developed derivatives markets" (Morningstar, Inc. - Rohr, Daniel, *et al*, 14-May-2013)

(iv) "In the company's own words, "Glencore's marketing activities are ordinarily substantially hedged in respect of price risk and principally operate a margin-based model" (Morningstar, Inc. - Research Department, 28-Jun-2012)[42]

---

[42] This mention categorised as 'not meaningful' as the use of a hedging term in the context of financial instrument usage is spurious/incorrect

Figure 7.1 summarises the methodology used in chapter 7

Figure 7.1
Summary of chapter 7 methodology

Selecting an appropriate sample period:

Year 2012 selected as sample year.

⇩

Selecting data sources:

(i) Derivatives usage data from annual reports.
(ii) Proxies for empirical analysis from DataStream database.
(iii) Analyst reports from Thomson Reuter's Investext database.

⇩

Selecting appropriate key words:

derivativ*, Hedg*, financial risk, market risk, interest rate risk, forward exchange, exchange rate risk, commodity risk selected as key words.

⇩

Selecting sample firms based on value change impact (VCI):

VCI is the outcome from derivative activities to the income statement compared to a firm producing average results from hedging activities. 34 extreme derivative winners/losers identified.

⇩

Selecting appropriate materials:

Equity research reports selected as a suitable material.

⇩

Selecting meaningful mentions of derivatives:

Based on key words from equity research reports.

⇩

Analysis

7.3 Empirical results and discussion

7.3.1 Descriptive statistics of winners and losers

There were 7,305 analyst reports available that satisfied the conditions stated in section 7.2. Table 7.4 summarises the total number of analyst reports included in the research. Also it's important to highlight that even though initially Derivativ*, Hedg*, financial risk, market risk, interest rate risk, forward exchange, exchange rate risk, commodity risk were selected as key words, only the words Derivativ* and Hedg* produced mentions relevant to this study. Therefore, from this point onwards discussion is based on these two words.

Table 7.4
Industry distribution of sample observations – Number and percentage of analyst reports

	Winners				Losers				Total			
Industry	**No of firms**	**Total No of analyst reports**	**No of analyst reports with mentions (all)**	**% analyst reports with mentions (all)**	**No of firms**	**Total No of analyst reports**	**No of analyst reports with mentions (all)**	**% analyst reports with mentions (all)**	**No of firms**	**Total No of analyst reports**	**No of analyst reports with mentions (all)**	**% analyst reports with mentions (all)**
Basic Materials	2	541	33	6.10%	2	696	6	0.86%	4	1,237	39	3.15%
Consumer Goods	1	132	7	5.30%	1	163	21	12.88%	2	295	28	9.49%
Consumer Services	5	1,012	171	16.90%	7	1,334	26	1.95%	12	2,346	197	8.40%
Healthcare	1	599	3	0.50%	0	0	0	0.00%	1	599	3	0.50%
Industrials	3	615	24	3.90%	0	0	0	0.00%	3	615	24	3.90%
Oil & Gas	0	0	0	0.00%	2	895	19	2.12%	2	895	19	2.12%
Telecom	1	250	2	0.80%	1	354	0	0.00%	2	604	2	0.33%
Utilities	3	551	27	4.90%	2	163	9	5.52%	5	714	36	5.04%
Grand total	**16**	**3,700**	**267**	**7.22%**	**15**	**3,605**	**81**	2.25%	**31**	**7,305**	**348**	4.76%

Table 7.4 shows the distribution of observations within the sample period in each category. It shows that amongst the published analyst reports in the Investext database, 3700 analyst reports fit into the ‘winners’ category, while 3605 analyst reports also passed suitability tests to be recognised as ‘losers’. In the case of winners, the consumer services category had the highest number of analyst reports with mentions about derivatives or hedging by both number and proportion while consumer goods category had the highest for losers. Nevertheless, 19 analyst reports were concerned when oil and gas firms produced negative results due to derivatives-related activities. The reasons behind this are explained by the value change impact score as oil and gas firms were negative contributors towards VCI. The important finding of this section is that only 7.2% of the analyst reports contained information about derivative hedging when they produced positive results. Moreover, this number was low as 2.2% when derivative transactions produced negative results.

Table 7.5

Industry distribution of sample observations – Number of pages and words

Industry	Winners						Losers					
	Total no of pages in analysts' report	No of pages with mentions	% pages with mentions	Total no of words in analysts' reports	No of times word “derivative--_” or "hedg--" mentioned	% words "derivative--" or "hedg--"	Total no of pages in analysts' report	No of pages with mentions	% pages with mentions	Total no of words in analysts' reports	No of times word “derivative--_” or "hedg--" mentioned	% words "derivative--" or "hedg--"
Basic Materials	6,855	102	1.49%	3,230,579	135	0.00418%	9,880	8	0.08%	4,782,061	11	0.00023%
Consumer Goods	2,191	8	0.37%	877,723	12	0.00137%	2,608	24	0.92%	1,242,961	24	0.00193%
Consumer Services	11,232	215	1.91%	5,460,127	328	0.00601%	16,053	26	0.16%	7,343,929	34	0.00046%
Healthcare	27,209	3	0.01%	8,717,154	3	0.00003%	0	0	0.00%	0	0	0.00000%
Industrials	9,615	62	0.64%	4,680,240	94	0.00201%	0	0	0.00%	0	0	0.00000%
Oil & Gas	0	0	0.00%	0	0	0.00000%	13,588	22	0.16%	6,948,569	26	0.00037%
Telecom	4,696	2	0.04%	2,017,594	2	0.00010%	5,817	0	0.00%	2,667,360	0	0.00000%
Utilities	10,189	43	0.42%	4,386,617	82	0.00187%	2,825	12	0.42%	1,051,582	19	0.00181%
Grand total	**71,987**	**435**	**0.60%**	**29,370,034**	**656**	**0.00223%**	**50,771**	**92**	**0.18%**	**24,036,462**	**114**	**0.00047%**

Table 7.5 provides descriptive statistics for winners and losers categories with regards to number of pages and words. Due to the variation in the number of pages

in an analyst report, extending the number of analyst reports into numbers of pages and words provides a more granular analysis.

Table 7.5 extends to the number of pages with mentions and the times word ‘hedg*’ and ‘derivative*’ are contained in analyst reports. It shows that regardless of the industry or whether derivatives-related activities produced a positive or negative outcome to income statement, the number of pages that discussed these activities was very limited. In the case of health care sector winners, proportion of pages with mentions was low as 0.01% compared to over 27,000 total pages of analyst reports. This small number of pages led to a low word count dedicated to hedging and derivatives use. Table 7.5 also presents the number of word ‘derivative’ and ‘hedg*’ are repeated in analyst reports. It shows that only 0.00223% words "derivative--" or "hedg--" appeared compared to total no of words in analysts' reports. From an accuracy standpoint, complex information about derivatives in financial reports could hinder analysts' ability to judge firm performance accurately (Chang *et al*., 2016). Even though the purpose of this chapter is not to examine the qualitative aspects of these reports, section 7.3.2 will examine the meaningfulness of these mentions from a quantitative viewpoint.

7.3.2 Additional empirical results of winners and losers

Section 7.3.1 reported the descriptive statistics of analysts’ coverage of derivatives reporting and disclosure in analyst reports. Section 7.3.2 examines the relevance and meaningfulness of these discussions by isolating meaningful mentions. Table 7.6 compares meaningful mentions with all mentions. In addition to that, table 7.7 extends the analysis to examine the number of words in sentences/paragraphs where a meaningful mention is found.

Table 7.6
Empirical results – meaningful mentions vs all mentions

	Winners		Losers		Total	
Panel A: No of 'all mentions'	**Number of analyst reports**	**Proportion (%) of analyst reports**	**Number of analyst reports**	**Proportion of analyst reports (%)**	**Number of analyst reports**	**Proportion of analyst reports (%)**
0	3,433	92.784	3,524	97.753	6,957	95.236
1	184	4.973	72	1.997	256	3.504
2	44	1.189	7	0.194	51	0.698
3	11	0.297	2	0.0555	13	0.178
4	21	0.568			21	0.287
5	3	0.081			3	0.041
6	2	0.054			2	0.027
7	0	0.000			0	0
8	1	0.027			1	0.014
9	0	0.000			0	0
10	0	0.000			0	0
11	1	0.027			1	0.014
Total	3,700	100%	3,605	100%	7,305	100%
Mean	0.118		0.026		0.072	
SD	0.539		0.179		0.406	

	Winners		Losers		Total	
Panel B: Number of 'meaningful mentions'	**Number of analyst reports**	**Proportion of analyst reports (%)**	**Number of analyst reports**	**Proportion of analyst reports (%)**	**Number of analyst reports**	**Proportion of analyst reports (%)**
0	3,510	94.865	3,571	99.057	7,081	96.934
1	142	3.838	30	0.832	172	2.355
2	26	0.703	4	0.111	30	0.411
3	9	0.243		0.000	9	0.123
4	9	0.243		0.000	9	0.123
5	1	0.027		0.000	1	0.014
6	1	0.027		0.000	1	0.014
7	1	0.027		0.000	1	0.014
8	0	0.000		0.000	0	0.000
9	0	0.000		0.000	0	0.000
10	0	0.000		0.000	0	0.000
11	1	0.027		0.000	1	0.014
Total	3700	100%	3605	100%	7305	100%
Mean	0.077		0.011		0.044	
SD	0.429		0.112		0.317	

Table 7.7
Empirical results – meaningful mentions vs all mentions (pages and word count)

Industry	Winners			
	All mentions		Meaningful mentions	
	Sum of Pages	Sum of words	Sum of Pages	Sum of words
Basic Materials	102	7,960	26	2,014
Consumer Goods	8	498	3	225
Consumer Services	215		177	
Healthcare	3	13,344	2	11,584
Industrials	62	177	57	112
Oil & Gas	0		0	
Technology	0	3,802	0	3,580
Telecom	2	0	0	0
Utilities	43		21	
Grand total	**435**	0	**286**	0

	Losers			
	All mentions		Meaningful mentions	
	Sum of Pages	Sum of words	Sum of Pages	Sum of words
Basic Materials	8	637	3	196
Consumer Goods	24	1,242	5	196
Consumer Services	26		11	
Healthcare	0	1,618	0	1,017
Industrials	0	0	0	0
Oil & Gas	22		7	
Technology	0	0	0	0
Telecom	0	913	0	376
Utilities	12		12	
		0		0
Grand total	**92**	0	**38**	0

Even though derivatives produce a favourable outcome, Table 7.6 panel A results show that amongst the winners category 92.8% of analyst reports did not mention anything about these transactions. In the case of the losers category this figure was even higher at 97.8%. Moreover table 7.6 Panel B results show that amongst the 348 analyst reports that discussed derivative and hedge accounting use, only 224 analysts succeeded in reporting meaningful information to users. As an example for something which is repeated verbatim, and so is not meaningful, JPMorgan repeatedly produced the following 10 times during the study period.

> “Macro factors – As an integrated oil & gas company, BP’s earnings and cash flow are naturally sensitive to oil and natural gas prices and refining margins. BP does not hedge any of these top line macro exposures” *(JPMorgan - Lucas, Frederick)*

The current study appreciates that repeating the above quote highlights the importance of this information. However, as seen in chapter four, BP is amongst the largest derivative users in the FTSE 100 Index; it is also among the highest contributors to FVTPL derivatives. As the bulk of the BP derivative fair values are not recognised as hedge accounting, this could have a direct impact on firm income. Investors are therefore entitled to a detailed analysis of derivatives use and how hedge accounting is being applied on these derivative positions. An average investor could have easily gathered the above information from BP’s annual report or other publicly available material rather than rely on a person who is considered to be an expert on the industry. Comparison of Table 7.7 with table 7.5 show that the total number of meaningful words in a sentence or a paragraph dedicated to explaining derivatives-related transactions is minimal.

7.4 Conclusion

This study adds to the very limited literature on analysts' understanding of derivatives and hedge accounting. The characteristic of data selection process extended previous studies, which mainly analysed the content of reports containing only a few pages. As this study did not differentiate and eliminate analyst reports based on the investment house or their originator and did not limit the study to specific sector, findings between the sectors were not based on the investment house covering the sector. The completely novel approach used in research design isolated the reports that were able to discover derivative use and their accounting information amongst comprehensive equity research reports. Furthermore, this innovative approach of manual text analysis of more than 53 million words explicitly identified whether the reports contained interpretation of meaningful data amongst outliers based on their value change impact score.

The central and most important issue is whether the complexity of derivatives increases the propensity of analysts' ability to understand derivative use as well as their accounting. Literature have reported inefficiencies and/or biases in analysts' ability to incorporate new information into their predictions and estimates (Hunton, McEwen and Bhattacharjee, 2001). Further, the results of chapter 7 complement the findings of Chang *et al*. (2016) using US data. They investigated whether the complexity of derivatives influences analysts' earnings forecasts and found that financial analysts' earnings forecasts for new derivatives users were less accurate and more dispersed after the introduction of derivatives. Further, they found that the reporting complexity of derivatives was the reason behind this rather than having multiple types of derivative instruments or hedging of multiple risk exposures. The current study's findings suggest that despite their expertise in finance and accounting, financial analysts rarely carry out a meaningful discussion about the earnings implications of derivatives and hedge accounting and perhaps do not appear to notice even extreme cases. The objective was to investigate the extent to which financial accounting information upon derivatives is used, and this chapter provides compelling evidence on the relatively little attention paid to derivatives/hedging information in their discussions by analysts irrespective of the importance (gains, losses and other relevant important information).

Chapter 8. Integration of results and Conclusions

8.1 Introduction and achievement of objectives.

The core objective of this research is to provide an up-to-date and accurate picture of the use of derivatives by the largest firms in the UK, focusing on before, during and after the 2007/2008 financial crisis. This is important both in light of the alleged role played by derivatives during the crisis and also the introduction of the mandatory use of IFRS on financial instruments disclosure and reporting. The existing empirical literature on this subject, particularly in the context of the UK, is rare; this research therefore aimed to provide answers to several research questions based on the following research objectives.

1. Investigate the extent and nature of derivatives usage amongst FTSE 350 non-financial firms
2. Investigate the determinants of the propensity to use derivatives amongst non-financial firms
3. Investigate the value relevance of derivative usage in non-financial firms
4. Investigate the extent of use of financial accounting information upon derivatives

The study results show that the extent and nature of derivatives usage can be analysed to a level previously not thought possible. Furthermore, as fair values of derivatives have never been used before for the UK as a continuous dependent variable to measure derivatives usage, the findings are not same as elsewhere in the world (e.g. the USA). This helped to achieve the second research objective; to investigate the determinants of the propensity to use derivatives amongst non-financial firms. The finding of a neutral/negative impact of derivative usage on firm value and the systematic disaggregation for the first time between instrument types and hedging categories enabled the study to investigate the value relevance of derivative usage in non-financial firms in greater detail than ever before. A completely novel approach to investigating the extent of the use of financial accounting information on derivatives showed compelling evidence as regards the extent to which derivatives/hedging information is discussed by analysts.

The remainder of chapter 8 presents the summary of findings on a chapter by chapter basis, followed by contributions to the literature and the key limitations of the study. Finally, recommendations for further research based on the findings of the study are also included.

8.2 Summary of findings

Chapter 4 examined the extent of derivative financial instruments usage by FTSE 350 non-financial firms listed on the London Stock Exchange from 2005 to 2012. The study found that over 92% of FTSE 100 firms used derivatives every year in the study period. Amongst FTSE 250 firms the proportion was between 63% and 80%. It also found that in both FTSE categories the proportion of derivatives users peaked towards the latter part of the financial crisis in 2008 and the beginning of the post-crisis period in 2009. As a measure of derivatives usage this study used derivatives fair values. It found that derivatives usage nearly doubled during the 2007/2008 financial crisis and peaked in 2008; afterwards it came back to pre-crisis levels.

In addition to that this study analysed the use of derivatives by instruments types (i.e. interest rate swaps, cross currency swaps, forwards currency contracts, commodity derivatives and other derivatives) and hedging categories (i.e. fair value hedge, cash flow hedge, net investment hedge) as well as derivatives recognised as fair value through profit or loss. It also extended the investigation down to industry level where instrument types and hedging categories were further disaggregated in-to their respective industries. Considering the proportions, interest rate swaps and foreign currency forwards were the most widely used derivatives instruments, while commodity derivatives appeared to be least used. However, with regards to derivative fair values, commodity derivatives had the highest gross fair values. Examination of hedge accounting use revealed that hedge accounting user proportions as well as derivative fair values recognised as hedge accounted are on an upward trend. It also identified cash flow hedges as the most commonly used hedging category while net investment hedges appeared to be the least used.

Chapter 5 extended previous findings on the extent of corporate use of derivatives by UK non-financial firms (Chapter 4) to examine the reasons behind derivatives use. Based on survey results, using an indicator variable or the notional value of derivatives, prior research argued that hedging reduced the expected cost of financial distress, tax liabilities, agency costs, external financing costs and cash flow volatility; derivatives use was therefore associated with these factors. Similar to the majority of previous studies, this study used a dummy variable to determine the decision to use derivatives. In addition to that, it extended the investigation to examine derivatives usage by using derivative fair values as a continuous variable for measuring derivatives usage, which is very rare in the literature. The evidence attained by analysing the logit and Tobit models showed that managing the expected cost of financial distress was the key intention of using derivatives amongst FTSE 350 non-financial firms. It also showed that the post 2007/2008 financial crisis the way firms managed their risk using derivatives was different to the remaining study period, indicating that the financial crisis had an impact on derivatives use.

Furthermore, it appeared to suggest that firms with higher expected costs arising from financially distress are keen users of hedge accounting to report their derivatives positions and likely to use hedge accounting to influence the tax system for their benefit. Also, it found that the effect of hedge accounting on reducing cash flow volatility is minimal. In addition to that, disaggregation of hedged derivative fair values into their respective hedging categories showed that fair value hedges had a positive association with larger firms, suggesting that larger firms benefit from economies of scale when it comes to hedging. The use of cash flow hedges and net investment hedges is also consistent with the underinvestment costs hypothesis. Additionally, net investment hedges are negatively related with cash flow volatility, a finding that is consistent with hedge accounting treatments.

Chapter 6 aimed to provide an answer to the question of whether hedging with derivatives is value relevant. With regards to the derivatives literature, the most widely used model for exploring the impact of hedging with derivatives on firm value is the method designed by Allayannis and Weston (2001) where they measured firm value by using Tobin's Q as a proxy. This study used the same methodology to examine whether the decision to use derivatives creates value; thereafter it extended its investigation into whether derivatives usage influences firm value.

The results found that derivatives users have a higher firm value than non- derivative users by 1.6%, suggesting that there is a hedging premium amongst derivative users. These results are in line with Allayannis and Weston (2001), Carter *et al*., (2006), Clark and Judge (2009) and Allayannis *et al*. (2011), who all found that derivative activities adds value to a firm. The results obtained using fair values of derivatives also showed that derivatives usage has a positive impact on firm value. Furthermore, the coefficients of several control variables are statistically significant, and have the sign predicted by the theory. ROA is highly significant and positively related to firm value, which is consistent with the argument that profitable firms have a higher firm value. Leverage is also highly significant (1%), with a negative sign as expected. This is consistent with Allayannis and Weston (2001) and Aggarwal and Zhao (2007) who documented a negative relationship between leverage and firm value for US data. Moreover, similar to Hoyt and Liebenberg (2015), the dividend variable showed a significant positive relationship, suggesting that dividends reduce the agency costs of free cash flows.

From empirical analysis of both the decision to use derivatives and the extent of derivatives use on firm value, the findings of this study suggest that the impact of hedging with derivatives on firm value is positive. This is in line with previous studies conducted using US data (Allayannis and Weston, 2001; Graham and Rogers, 2002; Carter *et al*., 2006). This suggests that there are fundamental similarities between US firms and UK firms with regards to derivatives use.

Compared to existing literature, one of the major strengths of Chapters 4 and 5 is that analysis has gone beyond the headline derivatives data to the furthest possible disaggregation level of derivatives. This enabled observation of the value relevance of different derivative instruments as well as the influence of hedging categories on firm value. The results showed that the market appears to value firms higher when they use interest rate swaps and forward currency contracts. However, using commodity contracts has a negative impact on firm value. With regards to hedging categories, the coefficients of cash flow hedges had a positive sign while fair value hedges and net investment hedges had negative coefficients. Nevertheless, only net investment hedge coefficients showed significant results.

In addition to using Tobin's Q to determine the value relevance of derivatives use, sensitivity analysis was carried out by using the Ohlson (1995) valuation framework. Using the Ohlson (1995) approach enabling an examination of the relevance of different accounting elements, hence enhancing the reliability of the findings. Separating the impact of derivatives in the income statement and the balance sheet showed that derivative-related accounting values integrated in the income statement positively and significantly related to market value, while derivative fair values in the balance sheet were negatively associated with market value. Further breaking down derivative-related balance sheet items into their respective instruments showed that interest rate swaps use and other derivatives use produce positive results towards firm value while forwards and commodity derivatives produce negative results. A similar approach showed that income carried to the income statement as a result of using hedge accounting positively relates to firm value. Simultaneously, fair values reported as fair value hedges and cash flow hedges are also positively related to firm value.

Chapter 7 examined the financial analysts' understanding of derivatives and hedge accounting. In order to measure analysts' understanding of derivatives, this study developed a scale based on meaningful mentions of derivatives and hedge accounting included in analyst reports. After analysing 53 million words included in 7,305 analyst reports, the study found that derivative (& derivatives) and hedge (&

hedging, hedges, hedged etc.) are the two most commonly used word when comes to derivative-related activities. Further ‘hedg*’ appeared more frequently than ‘derivative*’ suggesting that financial analysts prefer the word ‘hedg*’ to ‘derivative’.

Furthermore, the results found that amongst the firms where derivative-related transactions had a positive impact on the income statement only 267 analyst reports contained information about derivatives. In the case of firms whose derivative-related activities had a negative outcome on the income statement analyst mentions were even fewer. The next study isolated meaningful mentions from other mentions about derivatives and also about hedging.

The findings showed that despite their expertise in finance and accounting, financial analysts rarely get involved in interpreting complex hedge-related transactions and only 7% of the analyst reports carry meaningful discussions when firms produced a favourable outcome due to derivatives, and only 2% when firms produced adverse results. Ryan (2012) suggested that the effects of derivatives on analysts' forecasts could differ based on whether a firm hedges a smaller portion or a larger portion of its risk. Nonetheless this study’s findings suggested that the earnings implications of derivatives and hedge accounting do not appear to be noticed by financial analysts even in important cases.

8.3 Contribution of the thesis

One of the main contributions of this thesis to the existing body of knowledge is it is the first to explore the extent and effects of derivatives and hedge accounting use on FTSE 350 non-financial firms before, during and after the 2007/2008 global financial crisis using IFRS fair value data in the UK. Examining the effects of derivatives during the global financial crisis is important, especially considering the alleged role derivatives played as it will help to prevent similar scenarios. This study not only identified the factors that drive derivatives use, but also recognised what determines firms to use various types of derivative instruments as well as the reasons for using different hedging categories. This provides an extensive analysis of the effects of derivatives and hedge accounting on UK non-financial firms; it therefore fills an important gap in the existing literature. In addition to the above contribution, even after the introduction of IFRS, as the extent of detailed disclosure about derivatives still greatly varies across firms, the study provides guideline for future researchers to achieve the highest possible success rate with their IFRS data gathering as it is still a cumbersome process. This can be identified as a key theoretical contribution of this study as its developed framework paves the way for advanced hedging models.

As the motivation for the use of derivatives comes from a variety of concepts, understanding the incentive to hedge is imperative since it provides insights into risk management and how a firm's hedging operations should be carried out. Hence the findings of this thesis add support to theoretical suggestions on the use of derivatives together with those obtained by analysing US and other countries. Further as study findings indicate that larger firms with higher expected cost of financial distress uses more derivatives, this study can be useful for market participants (i.e. managers, executives, policy makers, auditors)

One of the main objectives of this research is to provide a greater understanding of the value relevance of derivatives use amongst UK non-financial firms. In the majority of cases, previous researchers limited their study to examining the relationship between the decision to use derivatives and firm value. This thesis extended this by evaluating the association between the extent of derivatives use and firm value using fair values of derivatives; the results therefore reflect a direct connection between the economic significance of derivatives usage and firm value. Further, this study has contributed to existing literature by providing a more comprehensive analysis of derivative use and firm value as prior literature mostly focused on one element at a time, hence the simultaneous effects of different elements were barely examined. Moreover, it also expanded the understanding of the application of derivatives accounting by separating the derivatives reporting into income and equity components within a robust setting.

This thesis has evaluated the usefulness of derivatives accounting standards from the perspective of financial analysts and adds to the small number of studies on analysts' understanding of derivatives and the application of hedge accounting and contributes by illustrating that, regardless of their financial expertise, analysts often failed to explain the implications of derivatives. This study also makes a methodological contribution by introducing 'value change impact of derivatives', which assists in identifying the extreme cases of derivatives usage which will ultimately lead to identifying isolated complex relationships with derivatives other than hedging.

8.4 Difficulties, limitations

One of the main limitations of the study is that it only examined the theories related to risk management using derivatives use and usage of hedge accounting. Although the study examined the relationship between alternative hedging instruments and derivatives in chapter 5 there are other ways used in risk management. Furthermore, the findings are mainly based on the assumption that firms used derivatives for hedging; therefore the concept of speculation has been overlooked. In addition, the decision to use derivatives was examined by logit regression and similarly derivative usage was investigated using the Tobit model. This study acknowledges that there are other sophisticated regression techniques that exist in the literature.

In order to enhance the reliability of its findings this study used Tobin's Q approach as well as the Ohlson (1995) approach to determine whether derivatives use or use of hedge accounting influence firm value. However, similar to the determinants study, there are other methodologies to examine the value relevance of derivatives use.

The examination of financial analysts' understanding of derivatives was carried out predominantly using analyst reports published between 2011 and 2013. Even though the author does not expect results to be different examining analysts' understanding of hedge accounting, using data from different years, especially IFRS data, would increase the validity of the current study's findings.

It is vital to emphasise that this study only investigated the effects of derivatives on the FTSE 350 non-financial firms, so it may therefore produce different findings with reference to financial firms as well as other jurisdictions. Also, the findings of this thesis are based on the proxy variables used to measure the risk management theories. Alternative proxies might therefore produce different results. Even though this study identified the hedging determinants based on the existing literature, another important limitation of this study is that these determining factors may not be absolute or exhaustive. Additionally, like any other study, omitted variable biasness can be identified as another limitation of the study.

8.5 Suggestions for further research

Section 8.4 described some of the limitations of this study that could be addressed in the future. Even though this thesis provided a comprehensive examination of the effects of derivatives on non-financial firms it can be extended to further research using other methodologies. Additionally, investigation of hedging using panel data is a promising area for future research as it will provide a better understanding of the impact of hedging over time. New methodologies could also be used to examine detailed information on various types of derivative instruments and hedging categories. The study also found that a substantial amount of derivative fair values are still not recognised under any of the hedging categories. Further research can be done on this area as it will assist accounting standard setters and policy makers to understand the underlying reasons behind this.

The third part of this thesis examines the effect of the use of derivatives on firm value. The results suggest that the usage of derivatives increased firm value. However, a very limited number of value relevance studies have been carried out using fair values of derivatives. This is another area future researchers could concentrate on. As outlined in Chapter 3, this study focused on hedging by larger firms, therefore a number of open research questions available for future research can be found based on derivatives use in smaller firms. This study used Tobin's Q and market values as a substitute for firm value. Studies using a variety of alternative measures of firm value with different methodologies and data sets would provide better understanding of derivatives on firm value.

This study highlighted the importance of future research on the interrelationship between financial reporting, derivatives and analysts' understanding of hedge accounting. Considering the very limited number of studied carried out in this area, numerous avenues are available to explore the robustness of the findings.

Finally, there is a scope to extend this study to FTSE all share as well as across other jurisdictions. Study findings can be used as a tool to examine results between US GAAP and IFRS. Finally, findings can be used to examine and compare existing theories surrounded the derivatives obtained mainly using US data.

Appendix 1: Introduction

AP 1.1 Important Definitions

This section provides an overview of the main definitions related to derivatives and their current accounting criteria.

AP 1.1.1 Derivative

International Financial Reporting Standards 9 (IFRS 9) defines a derivative as a financial instrument or other contract with all three following characteristics.

> *(a) Its value changes in response to the change in a specified interest rate, financial instrument price, commodity price, foreign exchange rate, index of prices or rates, credit rating or credit index, or other variable, provided in the case of a non-financial variable that the variable is not specific to a party to the contract (sometimes called the 'underlying').*
>
> *(b) It requires no initial net investment or an initial net investment that is smaller than would be required for other types of contracts that would be expected to have a similar response to changes in market factors.*
>
> *(c) It is settled at a future date.*

IFRS 9 simplifies and detail the definition of derivatives further (IAS 39 - AG9);

> *Typical examples of derivatives are futures and forward, swap and option contracts. A derivative usually has a notional amount, which is an amount of currency, a number of shares, a number of units of weight or volume or other units specified in the contract. However, a derivative instrument does not require the holder or writer to invest or receive the notional amount at the inception of the contract. Alternatively, a derivative could require a fixed payment or payment of an amount that can change (but not proportionally with*

a change in the underlying) as a result of some future event that is unrelated to a notional amount.

Some contracts are therefore considered as derivatives even without a notional value[43]. Further the definition of a derivative in the IFRS 9 includes contracts that are settled gross by delivery of the underlying financial or non-financial item[44].

Definitions in Appendix A (BA.3) further demonstrate how derivatives differ from other financial instruments with regards to defining characteristics such as the requirement of a smaller initial net investment to initiate a derivative contract.

AP 1.1.2 Fair Value

IFRS 13 Appendix A defines the fair value as,

> *"the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date".*

This definition of fair value emphasises that it is a market-based measurement rather than an entity-specific measurement. When measuring fair value, firms must use the assumptions that all market participants would use when pricing the assets and liabilities under current market conditions, which includes assumptions about risk. Hence a firm's intention to hold/sell an asset or to settle a liability has no relevance when measuring fair value.

[43] Definitions (Appendix A) BA.1

[44] Definitions (Appendix A) BA.2

AP 1.1.3 Hedge Accounting

In order to qualify for hedge accounting, a hedging relationship must meet the following qualifying criteria (IFRS 9 Para 6.4).

> *(a) The hedging relationship consists only of eligible hedging instruments and eligible hedged items.*
>
> *(b) At the inception of the hedging relationship there is formal designation and documentation of the hedging relationship and the entity's risk management objective and strategy for undertaking the hedge. That documentation shall include identification of the hedging instrument, the hedged item, the nature of the risk being hedged and how the entity will assess whether the hedging relationship meets the hedge effectiveness requirements (including its analysis of the sources of hedge ineffectiveness and how it determines the hedge ratio).*
>
> *(c) The hedging relationship meets all of the following hedge effectiveness requirements:*
>
> > *(i) there is an economic relationship between the hedged item and the hedging instrument (see paragraphs B6.4.3–B6.4.5);*
> >
> > *(ii) the effect of credit risk does not dominate the value changes that result from that economic relationship (see paragraphs B6.4.6 and B6.4.7); and*
> >
> > *(iii) the hedge ratio of the hedging relationship is the same as that resulting from the quantity of the hedged item that the entity actually hedges and the quantity of the hedging instrument that the entity actually* uses *to hedge that quantity of hedged item. However, that designation shall not reflect an imbalance between the weightings of the hedged item and the hedging instrument that would create hedge ineffectiveness (irrespective of whether recognised or not) that could*

result in an accounting outcome that would be inconsistent with the purpose of hedge accounting. (See paragraphs B6.4.8–B6.4.10).

The above hedge accounting qualifying criteria highlight two important aspects of hedge accounting namely (i) hedging instrument (ii) hedged item.

AP 1.1.3.1 Hedging instruments

IFRS paragraph 6.2.1 - 6.2.3 sets out the criteria for selecting an instrument as a ‘hedging instrument’.

6.2.1 A derivative measured at fair value through profit or loss may be designated as a hedging instrument, except for some written options (see paragraph B6.2.4).

6.2.2 A non-derivative financial asset or non-derivative financial liability measured at fair value through profit or loss may be designated as a hedging instrument unless it is a financial liability designated as at fair value through profit or loss for which the amount of its change in fair value that is attributable to changes in the credit risk of that liability is presented in other comprehensive income in accordance with paragraph 5.7.7.

6.2.3 For hedge accounting purposes, only contracts with a party external to the reporting entity (ie. external to the group or individual entity that is being reported on) can be designated as hedging instruments.

AP 1.1.3.2 Hedged item

IFRS paragraph 6.3.1 - 6.3.6 sets out the criteria for selecting an asset or liability as a ‘hedged item’.

6.3.1 A hedged item can be a recognised asset or liability, an unrecognised firm commitment, a forecast transaction or a net investment in a foreign operation.

The hedged item can be:

(a) a single item, or

(b) a group of items (subject to paragraphs 6.6.1–6.6.6 and B6.6.1–B6.6.16).

A hedged item can also be a component of such an item or group of items (see paragraph 6.3.7 and B6.3.7–B6.3.25).

6.3.2 The hedged item must be reliably measurable.

6.3.3 If a hedged item is a forecast transaction (or a component thereof), that transaction must be highly probable.

6.3.4 An aggregated exposure that is a combination of an exposure that could qualify as a hedged item under paragraph 6.3.1 and a derivative may be designated as a hedged item (see paragraphs B6.3.3 and B6.3.4). This includes a forecast transaction of an aggregated exposure (ie. uncommitted but anticipated future transactions that would give rise to an exposure and a derivative) if that aggregated exposure is highly probable and, once it has occurred and therefore is no longer forecast, is eligible as a hedged item.

6.3.5 For hedge accounting purposes, only assets, liabilities, firm commitments or highly probable forecast transactions with a party external to the reporting entity can be designated as hedged items. Hedge accounting can be applied to transactions between entities in the same group only in the individual or separate financial statements of those entities and not in the consolidated financial statements of the group.

6.3.6 However, as an exception to paragraph 6.3.5, the foreign currency risk of an intragroup monetary item (eg. a payable/receivable between two subsidiaries) may qualify as a hedged item in the consolidated financial statements if it results in an exposure to foreign exchange rate gains or losses that are not fully eliminated on consolidation in accordance with IAS 21 The

Effects of Changes in Foreign Exchange Rates. In accordance with IAS 21, foreign exchange rate gains and losses on intragroup monetary items are not fully eliminated on consolidation when the intragroup monetary item is transacted between two group entities that have different functional currencies. In addition, the foreign currency risk of a highly probable forecast intragroup transaction may qualify as a hedged item in consolidated financial statements provided that the transaction is denominated in a currency other than the functional currency of the entity entering into that transaction and the foreign currency risk will affect consolidated profit or loss.

AP 1.1.3.3 Accounting for qualifying hedging relationships

IFRS 9 paragraph 6.5 identifies three types of hedging relationships.

(a) fair value hedge: *a hedge of the exposure to changes in fair value of a recognised asset or liability or an unrecognised firm commitment, or a component of any such item, that is attributable to a particular risk and could affect profit or loss*[45]*.*

(b) cash flow hedge: *a hedge of the exposure to variability in cash flows that is attributable to a particular risk associated with all, or a component of, a recognised asset or liability (such as all or some future interest payments on variable rate debt) or a highly probable forecast transaction, and could affect profit or loss*[46]*.*

(c) hedge of a net investment: *in a foreign operation as defined in IAS 21*[47]*.*

---

[45] IFRS 9 para 6.5.8 – 6.5.10 states how fair value hedges been accounted for.

[46] IFRS 9 para 6.5.11 - 6.5.12 states how cash flow hedges been accounted for.

[47] IFRS 9 para 6.5.13 - 6.5.14 states how net investment hedges been accounted for.

AP 1.2 Derivatives Exchanges and their Growth

It is difficult to precisely identify the very first derivative as the forms of derivatives go back to ancient times where people made agreements to exchange an underlying asset within a specified timeframe for an agreed price instead of exchanging the actual asset. Usually the underlying asset was a commodity item such as an agricultural product. In the 19th century the risk of fluctuating grain prices became an important issue in the Chicago grain market. During harvest, farmers had no option but to accept very low prices due to heavy grain supply. In contrast, the lack of supply during the spring season pushed grain prices higher. The absence of a centralized marketplace and the huge price volatility created uncertainly among both producers and suppliers.

AP 1.2.1 Chicago Board of Trade (CBOT)

As a solution to the boom and bust cycles of agricultural product prices, in 1848 a group of businessmen in Chicago formed the Chicago Board of Trade (CBOT). This was the first formal commodities exchange in the US for spot and forward contracting (Dubofsky, 1992). CBOT offered a system where farmers could get a guaranteed price for their agricultural products prior to the harvest by offering 'to arrive' contracts. In addition to farmers, merchants benefited as they knew the price and the size of the supply in advance. However, during the harvest, if there was surplus supply, merchants were better off breaking their contract and buying at cheaper prices. Equally, if there was an unanticipated shortage of grain, producers had an incentive to break their contractual obligations as they could sell their grain for higher prices. As a solution for this, a system called “margin money” was implemented. Margin money is a system where both farmers and merchants kept a deposit with a third party at the beginning of a contract.

Even though trading these were not particularly active at the beginning, over time these ‘to arrival’ contracts became particularly standardised. This led to speculators trading in these contracts. They did not intend holding any stocks, instead they followed trading strategies based on their beliefs about the direction of the commodity prices. These speculators provided the liquidity to the market and acted as hedgers to farmers and merchants transferring the unwanted price risk. By the 1870s the basic trading structure of these contracts and the rules and regulations to ensure the smooth functioning of the marketplace were established (Ritchken, 1996).

Among other parallel future exchanges markets such as the New York Cotton Exchange, the New Orleans Cotton Exchange and the Chicago Mercantile Exchange (formerly known as The Chicago Butter and Egg Board), CBOT enhanced its reputation as a well-established national financial centre in the world. Commodity derivatives developed at a steady rate until the late 1970s and by that time futures contracts covered commodities from pork bellies to petroleum products such as crude oil and gasoline. Nevertheless, until the start of the 1970s financial derivatives were unimportant. Major economic and political events in the 1970s greatly changed the economic environment worldwide. The collapse of the international Bretton Woods fixed exchange rate system in 1973, the OPEC oil crisis and high inflation in the US arising from the Vietnam war led to long-standing exchange rate volatility and high inflation in all major developed countries. These economic conditions increased demand for hedging instruments capable of providing protection against the undesirable consequences of galloping inflation as well as the exchange and interest rate volatility of the 1970s. Therefore, in addition to agricultural commodities, from the 1970s CBOT began to trade financial derivatives. CBOT founded its sister company "The Chicago Board Options Exchange" (CBOE) in 1973 specifically to trade securities options. Further, futures contracts on Government National Mortgage Association certificates (Ginnie Maes) were commenced trading in CBOT in 1975. In 1977 trading of U.S. Treasury bonds began in CBOT.

Since its inception, CBOT was organised as a not for profit association and carried the trades in open outcry format. By the latter part of the 1990s, CBOT suffered a decline in trading volume. Hence to maintain its activities and standards with other exchanges, CBOT had to change its structure to a "for profit" organisation with electronic trading facilities. Finally, in 2007 Chicago Mercantile Exchange (CME) merged with CBOT to form CME Group.

AP 1.2.2 The History of Option Markets

In more recent times, options have often been used as an instrument for speculation as well as for hedging risk. History suggests that in the past options market did not function quite as smoothly as today. At the beginning of the 17th century tulips were particularly popular as a symbol of status among the Dutch aristocracy. With the popularity of tulips expanding across Holland, the prices also increased considerably. In order to hedge the risk from an unexpected harvest, tulip merchants began to buy call options while conversely tulip growers protected their profits with put options. Initially, option trading on tulip bulbs appeared to be a completely normal economic activity. With the rise in tulip prices the value of the existing option contracts increased and simultaneously a secondary market for those options emerged among the general public. However, in 1637 the tulip price bubble burst and prices plummeted, resulting in heavy losses for speculators. This incident is commonly known as “Tulip Mania” (Goldgar, 2007).

AP 1.2.2.1 Birth of the US Option Market

Trading of call and put options began in the US and Europe in the 18th century (Hull, 1998). Just after the inception of the New York Stock Exchange (NYSE) in 1792, interest for stock options arose among investors. However, in the early days brokers traded them over the counter (OTC) due to the lack of a centralized marketplace for options. Additionally, due to corrupt practices such as brokers getting options on certain shares as an incentive for recommending that share to clients, option markets had a bad reputation. In the beginning of the 20th century, a group of firms set up an association known as ‘Put and Call Brokers and Dealers Association’ with the intention of providing a system for bringing the buyers and sellers together. The functionality of this association was similar to the modern OTC derivatives market.

The stock market crash in 1929 led the way to the creation of the Securities and Exchange Commission (SEC), which became the regulating authority for financial markets under the Securities and Exchange Act of 1934. Soon after, the SEC began to regulate the OTC options markets and granted CBOT a license to act as a national securities exchange. Low volumes of commodity futures forced CBOT to expand its business to other areas; CBOT built an exchange for stock options with open outcry system. As a result, Chicago Board Options Exchange (CBOE), the first organised option market, opened in 1973.

AP 1.2.2.1.1 Chicago Board Options Exchange (CBOE)

Since opening, CBOE has traded standardised listed options. Additionally, in order to carry out the clearing and settlement functions, the Chicago Board Options Exchange Clearing Corporation (CBOECC) was formed. With increased trading volumes, the necessity of technology was evident; in 1975 a computerised price reporting system was introduced. In the same year the Options Clearing Corporation (OCC) became the central clearing house for all US options exchanges, replacing the CBOECC. With the rapid growth in options trading, CBOE continued to introduce new innovative financial instruments. In addition to options on shares, CBOE transformed the options industry by issuing options on stock indexes. In March 1983 CBOE introduced CBOE-100 Index options (later renamed as S&P 100 index options). The underlying asset of these options was the S&P 100 index. In the same year options on the S&P 500 Index commenced. As the volume accelerated rapidly, CBOE introduced its Retail Automatic Execution System (RAES) in 1984 to facilitate electronic trading and order executions. CBOE added options on interest rate products to its derivatives instruments portfolio in 1989. In the same year, it launched its first electronic customer limit order book, the 'EBook'. CBOE continued its expansion by acquiring the NYSE's options trading business in 1997. In 2008, 35 years after its inception, CBOE increased its daily contracts volume from 911 contracts to 9,975,464 contracts marking the busiest single day in its history.

AP 1.2.2.1.2 The London International Financial Futures and Options Exchange (LIFFE)

The London International Financial Futures and Options Exchange, commonly known as LIFFE, was established in 1982 following the removal of foreign exchange controls in the United Kingdom. LIFFE was initially set up as a financial options and futures exchange, and since then has developed a diverse range of derivatives products. In its first decade of operations, it offered various derivatives contracts on interest rates in most major currencies. The merger with London Traded Options Market (LTOM) in 1992 enabled LIFFE to add equity options to its financial product portfolio range. As a result of the 1996 merge with the London Commodity Exchange (LCE) it added a wide range of soft and agricultural commodity contracts to its financial products range. During most of its existence as an independent exchange, LIFFE used an open outcry system to facilitate trades where traders met in a designated area called the “pit” to transact their business. In order to continue developing as a leading derivatives exchange, in 1998 LIFFE planned to shift to an electronic platform called LIFFE CONNECT. In January 2002 Euronext[48] acquired LIFFE. This created Euronext.LIFFE, combining the derivatives activities of Amsterdam, Brussels, Lisbon and Paris together with the London derivatives exchanges, creating a single market for derivatives by bringing all its derivatives products together on a single electronic trading platform. Finally, in 2007 Euronext merged with NYSE Group creating a Euro-American multinational financial services corporation that operates in multiple securities exchanges.

The growth of the futures and options markets is not ended yet. New derivatives exchanges are emerging around the world. New derivatives instruments are being launched periodically. All of these different derivatives instruments divide into two broad categories, namely exchange traded and over the counter derivatives (OTC). The next section will discuss the two main categories of derivatives and subsequently the key derivatives instruments.

[48] The European electronic stock exchange based in Amsterdam, Netherlands

AP 1.3 Derivatives Categories

AP 1.3.1 Exchange-Traded Derivatives

Exchange-traded derivatives are the first of the two categories. These are standardised instruments traded on an organised derivatives exchange. In order to reduce the credit risk of exchange-traded derivatives, a clearing house acts as an intermediary between the purchaser and the vendor. The clearing house will ensure that the required margins are maintained throughout the transaction while gains or losses are adjusted to the margin. Traditionally derivatives exchanges used the open outcry system which involves physically meeting on a trading floor and carry out transactions for their clients. However now almost every derivatives exchange in the world uses the electronic trading facilities which involve the traders enter their orders to a centralised computer system and the computer system being used to match and execute these orders.

AP 1.3.2 Over the Counter Derivatives (OTC)

The alternative to exchange-traded derivatives is OTC derivatives. In fact, this is a network of dealers connected by a computer-linked telephone system and trades done over the phone. Often banks and financial institutions are the main suppliers of OTC products. OTC derivatives products could be shaped to the specific requirements of the purchaser without the need of a clearing house. Trades in the OTC markets are typically much larger than trades in the exchange-traded markets (Hull, 2007).

OTC and exchange-traded derivatives both have their own pros and cons. OTC products can be tailor made, hence better risk management ability. However, they can be costly, illiquid and carry a higher credit risk, whereas exchange-traded derivatives provide increased liquidity, lower transaction costs and less credit risk, although they cannot be customised to customers' specific needs.

Even though currently there are many different types of different derivatives instruments available worldwide, until the beginning of 1970s only few instruments were available, mostly forwards, futures contracts and the options. Next section will discuss some of the popular derivatives instruments.

AP 1.4 Types of Derivatives Instruments

AP 1.4.1 Forward Contracts

The simplest definition of a forward contract is an agreement to buy or sell an asset at a certain future time for a predetermined price (Blake, 2007). By and large forwards are considered to be OTC derivative products and usually traded between two financial institutions or between a financial institution and one of its clientele. One party to the forward contract agrees to purchase an underlying asset at a certain price at a specified future date, hence assuming a long position while the other party assumes a short position and agrees to sell the same asset with the same conditions. There are two types of forward contracts in relation to the maturity date on which the agreed exchange is made (Windstone, 1995). The first type of forward contract is a fixed forward contract where the payment or receipt of the currency take place on the predetermined fixed date. The second type is a forward option contract where the exchange of currency can be done between two agreed dates. Another variation of a forward contract is "rage forward contract" (also known as a flexible forward contract). In these contracts, rather than a single forward rate, a range of rates is being quoted. If the spot rate at the maturity lies between the predetermined rate, the spot rate will be used for final settlement figures. If the spot rate at maturity is below the lower limit, the lower limit will be used to calculate the settlements. On the other hand, in a situation where the spot rate at maturity is higher than the upper limit, the upper limit will be used for calculations. The main advantage of forwards is the low initialisation cost and being contingent prior to becoming an absolute liability.

From 1851 forwards were traded in the CBOT. This was the first organised exchange which added the forwards to their exchange tradable financial instrument list. In the early days commodity forward contracts were mainly designed for the suppliers of agricultural products and for the traders who bought the products for resale purposes; hence outsiders to the transaction only had a little use and interest. However, with the expansion of the financial system, the concept of forwards expanded and financial forwards such as interest rate and currency forwards emerged. Even with these, financial forwards had limited tradability; due to different maturity dates, currencies and contract values it was impractical to standardise these contracts.

As a solution to the illiquidity of the forwards contracts, futures contracts emerged. Forwards and futures contracts can be identified as one of the earliest forms of derivatives instruments and the basic building blocks for all the other different types of derivatives used at present.

AP 1.4.2 Futures Contracts

Futures contracts are similar to forward contracts, but are standardised contracts with fixed features (Blake, 2007). Due to futures being standardised products, these can be exchanged through an organised exchange. “Although financial futures are relatively new, commodity futures were very ancient. The honour as to where the first futures market developed is a matter of historical discussion” (Winstone, 1995). Further, he adds that examples of futures trading in India can be seen as early as 2000 BC and afterwards in Roman times; however, it is most likely that not until the 12th century, at French and English mediaeval fairs, that something similar to modern futures trading took place. In 1697 there appeared to be the first recorded trading of rice futures taking place in the Osaka area of Japan, and the Dojima rice market has been described as the world’s first futures market.

The modern future contracts markets started and developed in the US; CBOT is the first truly exchange-traded futures market in the world (Winstone, 1995). In 1870 cotton futures commenced trading on the New York Cotton Exchange and since then many other exchanges worldwide have offered a wide variety of futures contracts.

The first financial futures contract was a foreign currency futures contract which began trading in 1972 on the international monetary market, a division of CME

(Dubofsky, 1992). Currently all tradable futures contracts fall into four main categories based on the underlying asset; (i) commodity futures, (ii) foreign currency futures, (iii) an interest-earning asset and (iv) an index such as a stock index. Due to futures being a useful hedging instrument and the ability to future price discovery of the underlying asset, futures contracts remain one of the widely used derivative instruments.

AP 1.4.3 Options

An option is a financial contract, whose value mostly depends on the value of an underlying asset class such as equities, interest rates, commodities, stock indexes, currencies or a financial asset and gives the holder of the option a right to purchase or sell the underlying asset; their instruments are traded both on exchanges and in the OTC markets. Options mainly differ in two ways by their purpose and the execution time. Call options and put options are the two types of options, which differ in their purpose. The owner of a call option has the right to buy the underlying asset at some specified price (call strike price) at a future date (the expiry date). Similarly, a holder of a put option has the right to sell an asset at some specified price at the maturity date. The original issuer of the option is therefore obliged to buy or sell the underlying asset at the strike price at the expiry date.

The other major difference is based on the execution date. European-style options can be exercised only at the expiry day of the option while American-style options can be exercised any time before the maturity. Options offer very low-cost leverage ability, especially compared to the cost involved in acquiring and disposing of the assets. Further, it could give enhanced liquidity, in particular when the contract is near to expiry due to the easy access to closing agreements.

The Black Scholes (1973) model can be used to price European-style options while, with some modifications, Merton (1973) showed that the Black Scholes (1973) model can be used to price American-style options if the share does not pay any dividends. As options are traded OTC and in financial exchanges both mechanisms have their own advantages and disadvantages. As any other OTC derivative product, OTC options can be tailor made to meet the customer's requirements, however it is generally costly than if it had been an exchanged-traded instrument. Due to the highly leveraged nature of options, speculators are able to hold the options without holding the underlying asset and the maximum loss that they could incur is their initial investment. In contrast, the option writer is exposed to unlimited losses as the option writer is obliged to accomplish the terms of the option in the event of it being exercised.

The economic conditions in the early 1970s, coupled with the development of derivative pricing methodologies, laid the foundations for the immense growth in derivatives markets. The increasing sophistication of computers made it easier to value derivatives, thus increasing derivatives trading and derivative markets. The second generation of derivatives can be identified as the development of swaps. The next section will briefly examine the development of swap products and their main characteristics.

AP 1.4.4 Swaps

A Swap is an OTC contract between two parties to exchange cash flows at a future date. The history of currency swaps goes back to the late 1970s while the interest rate swap market has existed since 1981 in its present form. These two are the most frequently used swap instruments. The basic principle of an interest rate swap is to change a company's fixed rate debt to floating rate debt (or vice versa) without costly refinancing options. Hence interest rate swaps can be beneficial for all parties in a contract as avoidance of costs is possible due to market imperfections (Turnbull, 1987). Furthermore, in an interest rate swap, due to no principal being exchanged, its risk declines as the swap approaches maturity.

Usually in an interest rate swap parties do not exchange principal. Hence the actual cash exchange between the parties is a small proportion of the principal amount (notional value). Later in 1984, especially in the US dollar interest rate swap market, banks began to develop “warehousing” where a client approached a bank without a counter party and agreed a swap contract with the bank until a suitable counter party could be found (Winstone, 1995). He suggests the introduction of standard terms of a swap agreement by the International Swaps and Derivatives Association (ISDA) and the British Bankers' Association (BBA) in 1985 contributed positively to the growth of the swap market.

Regulation was another key factor in the emergence of new derivatives products. The first currency swaps were carried out in the late 1970s to avoid UK foreign exchange control regulations (McClintock 1996). In order to minimise the tax incurred on foreign exchange transactions denominated in sterling, UK firms engaged in back-to-back loans. The difficulty of finding a counter party with similar requirements and the higher default risks linked with two loans established in two different countries in two different legal settings led the development of currency swaps. Not only did these contracts reduce the transaction cost as the currency swaps integrated both loans into a single contract, also decreased the need to find a party with similar requirements. Unlike an interest rate swap, currency swaps involve more credit risk due to a less liquid market and exchanging the principal amount at maturity. Further, as the swap approaches maturity, the value of a currency swap contract generally increases.

In addition to using swaps to transform a liability, they can be further used to transform the nature of an asset. Similar to transforming floating rate debt to fixed rate debt, a swap contract can be customised to convert an asset which earns a floating rate of interest into an asset with a fixed rate of interest (or vice versa). In addition to the basic interest rate and currency swaps there are various other types of swaps[49] and swaps with embedded options[50] can also be seen in the market place. Considering the diverse variation of swap products, these can be identified as an innovative risk management tool developed by the imagination of financial engineers.

---

[49] E.g. Overnight index swaps, equity swaps, commodity swaps, volatility swaps, differential swaps, compounding swaps, LIBOR-in-Arrears swaps, Constant maturity swaps(CMS), constant maturity treasury swap(CMT), indexed principal swap, basis swap, circus swap, reverse swap, cap swap, step-up swap

[50] E.g. Accrual swaps, cancellable swaps, cancellable compounding swaps

AP 1.4.5 Credit default swaps

Credit derivatives enable firms to manage their credit risk in the same way as other derivatives assist to manage market risk; and the payoffs depend on the creditworthiness of a firm or a country. Credit Default Swaps (CDS) are the most popular credit derivative and can be identified as another innovative financial derivative contract of the modern era (Hull, 2012). In order to protect against a loan default, the purchaser of the CDS makes a series of payments to the seller, while the seller agrees to compensate the buyer in an unforeseen credit non-payment event. Hence the seller of the CDS assures the creditworthiness of the debt instrument. The format of CDSs enables the credit exposure of fixed income products to be spread among several parties. The purchaser of the CDS does not have to hold the underlying debt security. Therefore, if the total outstanding CDS values are higher than the face value of the actual debt instrument, in the event of a default the payment received by the seller could be considerably less than the face value of the loan as the payouts to the buyers of protection is determined by the ISDA auction process. The European parliament has approved a ban on holding CDSs without holding the underlying debt or direct insurable interest with the debt instrument, effective from 1st December 2011 (Barker, 2012).

The idea of the modern credit default swaps was created by the bankers of New York-based J. P. Morgan & Co in 1994 (Philips, 2008). To eliminate the capital adequacy issues with the credit line for potential damages of $5 billion resulting from the 1989 Exxon Valdez oil spill, J. P. Morgan bankers signed a contract with the European Bank of Reconstruction and Development (E.B.R.D).. During the 2007 credit crunch CDSs came under a great deal of scrutiny from regulators as they believed that CDSs contributed enormously to the vulnerability of the financial markets. This was fuelled by the bailout of the US insurance giant AIG by the US government. This led to CDS transactions being moved to the clearing house process where market participants were required to keep margins on their CDS trades. As the importance of CDS depends on the probability of a firm failing to pay its debts, CDSs still remain an important financial tool for managing credit risk.

AP 1.5 Evolution of Financial Instrument Accounting and Disclosure Regulations

Accounting and disclosure requirements for financial instruments have undergone a continuous change in the past quarter of a century. Much of these changes have been a necessity due to the rapid consistent development of capital markets and increased volatility. On the other hand, the high volatility of the markets encouraged the development of different innovative financial instruments, especially in relation to derivatives.

Prior to the introduction of accounting and disclosure measures, publishing the use of derivatives in the financial statements was voluntary and usually carried at historical cost in the financial statements. With the introduction of financial accounting standards, the historical cost approach changed to much more sophisticated reporting procedures, such as reporting the derivatives by offsetting the value of the derivatives contract with the value of the hedged item. Hence by looking at the balance sheet, it is impossible to distinguish between the hedged asset or liability and the unhedged, therefore concealing the extent of derivatives usage. Additionally, firms can use derivatives purely for speculative purposes without having the underlying asset. Due to the off-balance sheet nature of derivatives, conventional accounting standards were not sufficient to understand the true nature of risks associated with derivative contracts, thus information in addition to what was reported in the balance sheets was needed. International standard setters attempted to tackle this issue with derivatives disclosure and reporting for a few decades.

AP 1.5.1 Derivatives Disclosure

In various ways firms benefit from providing voluntary disclosures (Armitage and Marston, 2008). Greater disclosure enhances stock market liquidity (Amihud and Mendelson, 1986) thereby reducing the cost of equity capital either through reduced transactions costs or increased demand for a firm's securities (Armitage and Marston, 2008). As disclosure of derivatives use was not mandatory, firms were free to decide what and when to disclose. However, with the well-publicised unexpected losses on derivatives, the introduction of mandatory requirements on derivatives disclosure was inevitable.

Over time disclosure of derivatives use moved from voluntary disclosure to mandatory disclosure. However, Choi and Guzman (1998) argued that mandatory disclosure is unnecessary and sometimes harmful. In contrast, Fox (1999) supported mandatory disclosure requirements arguing, it will benefit both investors and intermediaries. At present, more information is provided in financial statements about derivatives and how firms used them. The accounting standards for derivatives were developed along with the development of accounting standards for financial instruments as derivatives themselves are a financial instrument. The next section will review the accounting standards for financial instruments for firms in the United Kingdom, how these were developed over time and the organisations responsible for developing these standards.

AP 1.5.2 Evolution of derivatives accounting in the United Kingdom

Accounting for financial instruments has been the most controversial in the development of accounting standards. As this is a very nebulous concept, standards were modified and re-written several times within a short period of time. Currently there are several accounting standards governing the derivatives use in UK firms; namely IAS 32, IAS 39, IFRS 7, IFRS 9 and IFRS 13. Table 1.1 shows the timeline of the development of IAS 32 and IAS 39 (Source: http://www.iasplus.com/)

AP Table 1.1
Development of IAS 32 and IAS 39

Date	Implementation/Amendment	Comments
October 1984	Exposure Draft E26 -Accounting for Investments	
March 1986	IAS 25 *Accounting for Investments*	Operative for financial statements covering periods beginning on or after 1 January 1987
September 1991	Exposure Draft E40 Financial Instruments	
January 1994	E40 was modified and re-exposed as Exposure Draft E48 Financial Instruments	
June 1995	The disclosure and presentation portion of E48 was adopted as IAS *32 Financial Instruments: Disclosure and Presentation*	
1 January 1996	Effective date of IAS 32 (1995)	
March 1997	Discussion Paper Accounting for Financial Assets and Financial Liabilities issued	
June 1998	Exposure Draft E62 Financial Instruments: Recognition and Measurement issued	Comment deadline 30 September 1998
December 1998	IAS 39 *Financial Instruments: Recognition and Measurement* (1998)	Effective date 1 January 2001
April 2000	Withdrawal of IAS 25 following the approval of IAS 40 Investment Property	Effective for financial statements covering periods beginning on or after 1 January 2001
October 2000	Limited revisions to IAS 39	Effective date 1 January 2001
17 December 2003	IAS 39 *Financial Instruments: Recognition and Measurement* (2004) issued	Effective for annual periods beginning on or after 1 January 2005
31 March 2004	IAS 39 revised to reflect macro hedging	Effective for annual periods beginning on or after 1 January 2005

17 December 2004	Amendment issued to IAS 39 for transition and initial recognition of profit or loss	
1 January 2005	Effective date of IAS 32 (2003)	
14 April 2005	Amendment issued to IAS 39 for cash flow hedges of forecast intragroup transactions	Effective for annual periods beginning on or after 1 January 2006
15 June 2005	Amendment to IAS 39 for fair value option	Effective for annual periods beginning on or after 1 January 2006
18 August 2005	Disclosure provisions of IAS 32 are replaced by IFRS 7 *Financial Instruments: Disclosures*. Title of IAS 32 changed to *Financial Instruments: Presentation*	Effective 1 January 2007
22 June 2006	Exposure Draft of proposed amendments relating to Puttable Instruments and Obligations Arising on Liquidation	
14 February 2008	IAS 32 amended for Puttable Instruments and Obligations Arising on Liquidation	
22 May 2008	IAS 39 amended for Annual Improvements to IFRSs 2007	Effective for annual periods beginning on or after 1 January 2009
30 July 2008	Amendment to IAS 39 for eligible hedged items	Effective for annual periods beginning on or after 1 July 2009
13 October 2008	Amendment to IAS 39 for reclassifications of financial assets	Effective 1 July 2008
1 January 2009	Effective date of amendments for puttable instruments and obligations arising on liquidation	
12 March 2009	Amendment to IAS 39 for embedded derivatives on reclassifications of financial assets	Effective for annual periods beginning on or after 1 July 2009
16 April 2009	IAS 39 amended for Annual Improvements to IFRSs 2009	Effective for annual periods beginning on or after 1 January 2010

6 August 2009	Exposure Draft Classification of Rights Issues proposing to amend IAS 32	
8 October 2009	Amendment to IAS 32 about Classification of Rights Issues	
12 November 2009	IFRS 9 Financial Instruments issued, replacing the classification and measurement of financial assets provisions of IAS 39	Original effective date 1 January 2013, later deferred and subsequently removed
1 February 2010	Effective date of the October 2009 amendment	
28 October 2010	IFRS 9 Financial Instruments reissued, incorporating new requirements on accounting for financial liabilities and carrying over from IAS 39 the requirements for derecognition of financial assets and financial liabilities	Original effective date 1 January 2013, later deferred and subsequently removed
16 December 2011	Offsetting Financial Assets and Financial Liabilities (Amendments to IAS 32) issued	
17 May 2012	Amendments resulting from Annual Improvements 2009-2011 Cycle (tax effect of equity distributions).	
1 January 2013	Effective date of May 2012 amendments (Annual Improvements 2009-2011 Cycle)	
27 June 2013	Amended by Novation of Derivatives and Continuation of Hedge Accounting	Effective for annual periods beginning on or after 1 January 2014 (earlier application permitted)
19 November 2013	IFRS 9 Financial Instruments (Hedge Accounting and amendments to IFRS 9, IFRS 7 and IAS 39) issued, permitting an entity to elect to continue to apply the hedge accounting requirements in IAS 39 for a fair value hedge of the interest rate exposure of a portion of a portfolio of financial assets or financial liabilities when IFRS 9 is applied, and to extend the fair value	Applies when IFRS 9 is applied

	option to certain contracts that meet the 'own use' scope exception	
1 January 2014	Effective date of December 2011 amendments	

AP Table 1.2 illustrates how IFRS 7 evolved over time (Source http://www.iasplus.com/)

AP Table 1.2
Development of IFRS 7

Date	Implementation/Amendment	Comments
22 July 2004	Exposure Draft ED 7 Financial Instruments: Disclosures published	Comment deadline 14 September 2009
18 August 2005	IFRS 7 *Financial Instruments: Disclosures* issued	Effective for annual periods beginning on or after 1 January 2007
22 May 2008	Amended by Improvements to IFRSs (required disclosures when interests in jointly controlled entities are accounted for at fair value through profit or loss, presentation of finance costs)	Effective for annual periods beginning on or after 1 January 2009
13 October 2008	Reclassification of Financial Assets (Amendments to IAS 39 and IFRS 7) issued	Effective 1 July 2008
23 December 2008	Exposure Draft Investments in Debt Instruments (Proposed Amendments to IFRS 7) published	Comment deadline 15 January 2009 (Project subsequently abandoned in January 2009)
5 March 2009	Improving Disclosures about Financial Instruments (Amendments to IFRS 7) issued	Effective for annual periods beginning on or after 1 January 2009
6 May 2010	Amended by Improvements to IFRSs (clarification of disclosures)	Effective for annual periods beginning on or after 1 January 2011

7 October 2010	Disclosures – Transfers of Financial Assets (Amendments to IFRS 7) issued	Effective for annual periods beginning on or after 1 July 2011
16 December 2011	Disclosures — Offsetting Financial Assets and Financial Liabilities (Amendments to IFRS 7) issued	Effective for annual periods beginning on or after 1 January 2013
16 December 2011	Mandatory Effective Date and Transition Disclosures (Amendments to IFRS 9 and IFRS 7) issued	Effective for annual periods beginning on or after 1 January 2015 (or otherwise when IFRS 9 is first applied)
19 November 2013	IFRS 9 Financial Instruments (Hedge Accounting and amendments to IFRS 9, IFRS 7 and IAS 39) issued, implementing additional disclosures (and consequential amendments) resulting from the introduction of the hedge accounting chapter in IFRS 9	Applies when IFRS 9 is applied

Table 1.3 shows the history of IFRS 9 (Source: http://www.iasplus.com/)

AP Table 1.3
Development of IFRS 9

Date	Implementation/Amendment	Comments
14 July 2009	Exposure Draft ED/2009/7Financial Instruments: Classification and Measurement published	Comment deadline 14 September 2009
12 November 2009	IFRS 9 Financial Instruments issued, covering classification and measurement of financial assets	Original effective date 1 January 2013, later removed
11 May 2010	Exposure Draft ED/2010/4 Fair Value Option for Financial Liabilities published	Comment deadline 16 July 2010
28 October 2010	IFRS 9 Financial Instruments reissued, incorporating new requirements on accounting for financial liabilities and carrying over from IAS 39 the requirements for derecognition of financial assets and financial liabilities	Original effective date 1 January 2013, later removed

4 August 2011	ED/2011/3 Amendments to IFRS 9 (2009) and IFRS 9 (2010): Mandatory Effective Date published, proposing the adjust the mandatory effective date of IFRS 9 from 1 January 2013 to 1 January 2015	Comment deadline 21 October 2011
16 December 2011	Mandatory Effective Date and Transition Disclosures (Amendments to IFRS 9 and IFRS 7) published	Amended the effective date of IFRS 9 to annual periods beginning on or after 1 January 2015 (removed in 2013), and modified the relief from restating comparative periods and the associated disclosures in IFRS 7
28 November 2012	Exposure Draft ED/2012/4Classification and Measurement: Limited Amendments to IFRS 9 (proposed amendments to IFRS 9 (2010)) published	Comment deadline 28 March 2013
19 November 2013	IASB issues IFRS 9 *Financial Instruments (Hedge Accounting and amendments to IFRS 9, IFRS 7 and IAS 39)* amending IFRS 9 to: • include the new general hedge accounting model; • allow early adoption of the requirement to present fair value changes due to own credit on liabilities designated as at fair value through profit or loss to be presented in other comprehensive income; and • remove the 1 January 2015 effective date	Removed the mandatory effective date of IFRS 9 (2009) and IFRS 9 (2010)

Table 1.4 shows the history of IFRS 13 - *Fair Value Measurement* (Source: http://www.iasplus.com/)

AP Table 1.4
Development of IFRS 13

Date	Implementation/Amendment	Comments

September 2005	Project on fair value measurement added to the IASB's agenda	
30 November 2006	Discussion Paper Fair Value Measurements published	Comment deadline 2 April 2007
28 May 2009	Exposure Draft Fair Value Measurement published	Comment deadline 28 September 2009
29 June 2010	Exposure Draft Measurement Uncertainty Analysis Disclosure for Fair Value Measurements published	Comment deadline 7 September 2010
19 August 2010	Staff draft of a IFRS on fair value measurement released	
12 May 2011	IFRS 13 *Fair Value Measurement* issued	Effective for annual periods beginning on or after 1 January 2013
12 December 2013	Amended by Annual Improvements to IFRSs 2010–2012 Cycle (short-term receivables and payables)	Amendment to the basis for conclusions only
12 December 2013	Amended by Annual Improvements to IFRSs 2011–2013 Cycle (scope of portfolio exception in paragraph 52)	Effective for annual period beginning on or after 1 July 2014

Following the initial Exposure Draft E40 *Financial Instruments* in September 1991, the International Accounting Standard Board leaped a huge step by issuing IAS 32 *Financial Instruments: Disclosure and Presentation* in June 1995. IAS 32 mainly provided the accounting requirements for the presentation of financial instruments and attempted to outline the guidance on matters relating to financial instruments disclosure[51]. In December 1998 the International Accounting Standard Board introduced IAS 39 *Financial Instruments: Recognition and Measurement*. IAS 39 outlined the requirements for the recognition and measurement of financial instruments[52]. At the initial stage of financial instrument reporting and disclosure, IAS 32 and IAS 39 can be identified as a major noteworthy development towards the mandatory requirement of financial instruments disclosure.

[51] Effective from 1st of January 1996

[52] Effective from 1st of January 2001

In addition, continuation of these efforts during the last decade resulted in International Financial Reporting Standard 7 - *Financial Instruments: Disclosures* (IFRS 7)[53] and International Financial Reporting Standard 9 - *Financial Instruments* (IFRS 9). Most recently, International Financial Reporting Standard 13 - *Fair Value Measurement* (IFRS 13) was introduced. Implementation of these standards will provide some assurance to financial statements users concerning derivatives use and the associated risks from the published financial statements. Section 1.10 will explore the organisations behind these accounting standards.

AP 1.6 The International Accounting Standards Board (IASB)

Based in London, the IASB is an independent and privately funded accounting standard body, established on April 1st, 2001, to replace the International Accounting Standards Committee (IASC). The board consists of representatives from several countries[54] and is designed to achieve convergence in accounting standards around the world. The initial IASB framework had four purposes – (i) defining the objectives of financial statements; (ii) identifying characteristics that make the information useful; (iii) defining the basic elements of financial statements; and (iv) providing concepts of capital maintenance. The IASB framework also has two assumptions (i) a financial transaction will be recorded when it happens rather than the cash received for the transaction (accrual basis); (ii) 'going concern', which assumes that a firm will remain in existence for the foreseeable future. In addition to those underlying assumptions, to increase the usefulness of information contained in financial statements, IASB recognised four qualitative characteristics.

- Understandability: Which requires that the information is immediately understandable by users who are supposed to have a reasonable knowledge of business and economic activities and accounting, and the willingness to study the information with reasonable diligence.

[53] Disclosure provisions of IAS 32 are replaced by IFRS 7 *Financial Instruments: Disclosures*. Hence title of the IAS 32 changed to *Financial Instruments: Presentation*

[54] Initially the founding members of IASB included the professional accounting bodies of United States, United Kingdom, France, Germany, Australia, Canada, Japan, Netherlands and Mexico

- Relevance: Which requires information given in the financial statements to be of a kind that would influence the economic decisions of users by helping them to evaluate events or to revise previous estimates.
- Reliability: Which supposes that the statements are free from errors or significant bias.
- Comparability: Which is the ability to compare financial statements over time or between entities.

The IASB is the independent standard-setting body of the International Financial Reporting Standards Foundation (IFRS Foundation) responsible for developing a single set of high quality, understandable, enforceable and globally accepted accounting standards. Broadly the accounting standards endorsed or issued prior to 2001 by IASB are called International Accounting Standards (IAS) and the accounting standards issued after 2001 are called International Financial Reporting standards (IFRS). “Since IFRS are primarily ‘principles-based’ standards, the IFRS approach to standard setting focuses more on the business or the economic purpose of a transaction and the underlying rights and obligations and therefore, instead of providing prescriptive rules, IFRS promulgates standards that lay down guidance in the form of principles” (Mirza and Holt, 2011)

Figure AP 1.1 summarizes the structure of the IASB.

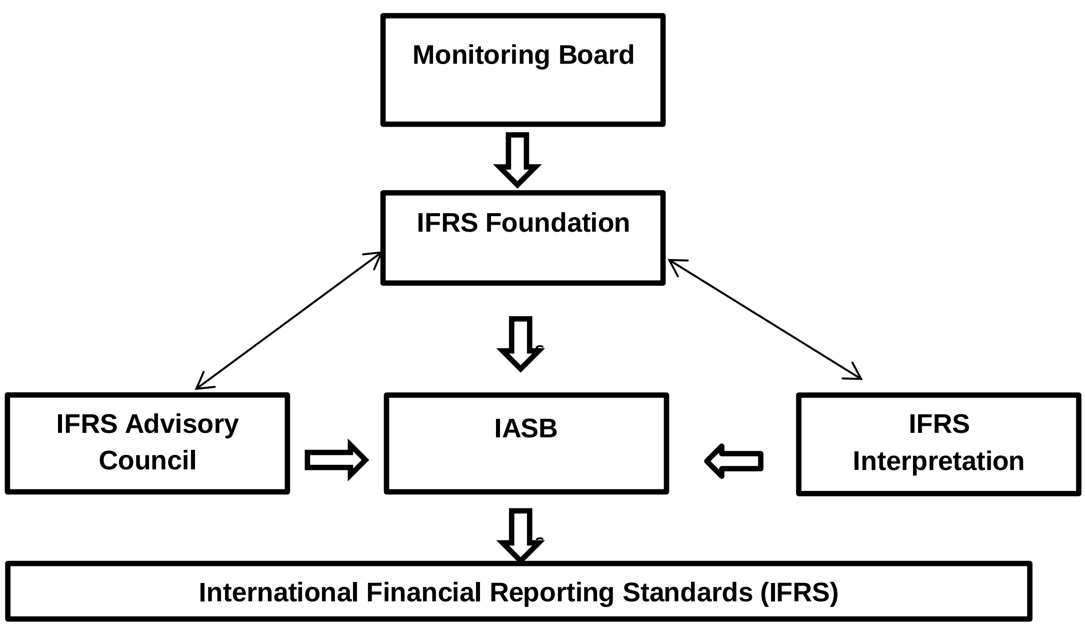


Figure AP 1.1 the structure of the IASB (Source: Cornerstones of Financial Accounting: Page 730)

AP 1.7 Accounting for derivative financial instruments

In order understand the data used in this study, this section will illustrate how current hedge accounting is carried out in practice with examples. The first example illustrates how a derivative can alter the risk profile of a firm.

Example 1:

UK-based firm "A" signs a contract to pay $1 million on 1st January 2013 for a delivery of copper from a US supplier on 31st March 2013. The US copper supplier would expect the payment on 30th June 2013 for the copper supplied. On 1st January 2013 the GBP spot rate for US$/GBP is $1.67/£1. At the current spot rate, it will cost firm A £598,802.40 for the copper supply. Firm A is worried that the US dollar will strengthen against sterling. Therefore, they enter into a forward contract to buy $1 million on 30th June 2013. The contract forward rate is $1.65/£1. Hence the copper firm A received on 31st March 2013 from the US supplier will cost it £606,060.60 on 30th June 2013.

Whether firm A's decision to lock in the exchange rate is a wise decision will depend on the spot rate on 30th June 2013. If the spot rate on 30th June 2013 was $1.63/£1 then $1 million would have cost them £613,496.93, making the decision to enter into a forward contract financially beneficial to firm A. However, if the US$ strengthening was marginal and the 30th June 2013 spot rate was $1.66/£1, then it would have only cost firm A £602,409.64. In those circumstances the decision to hedge with a derivative would not have given the best financial benefit to the firm A. However, firm A effectively eliminated its exchange rate risk on the above copper purchase with the forward contract.

AP 1.7.1 Derivatives accounting and reporting standards

Figure AP 1.2 summarizes the current accounting standards with regards to derivatives.

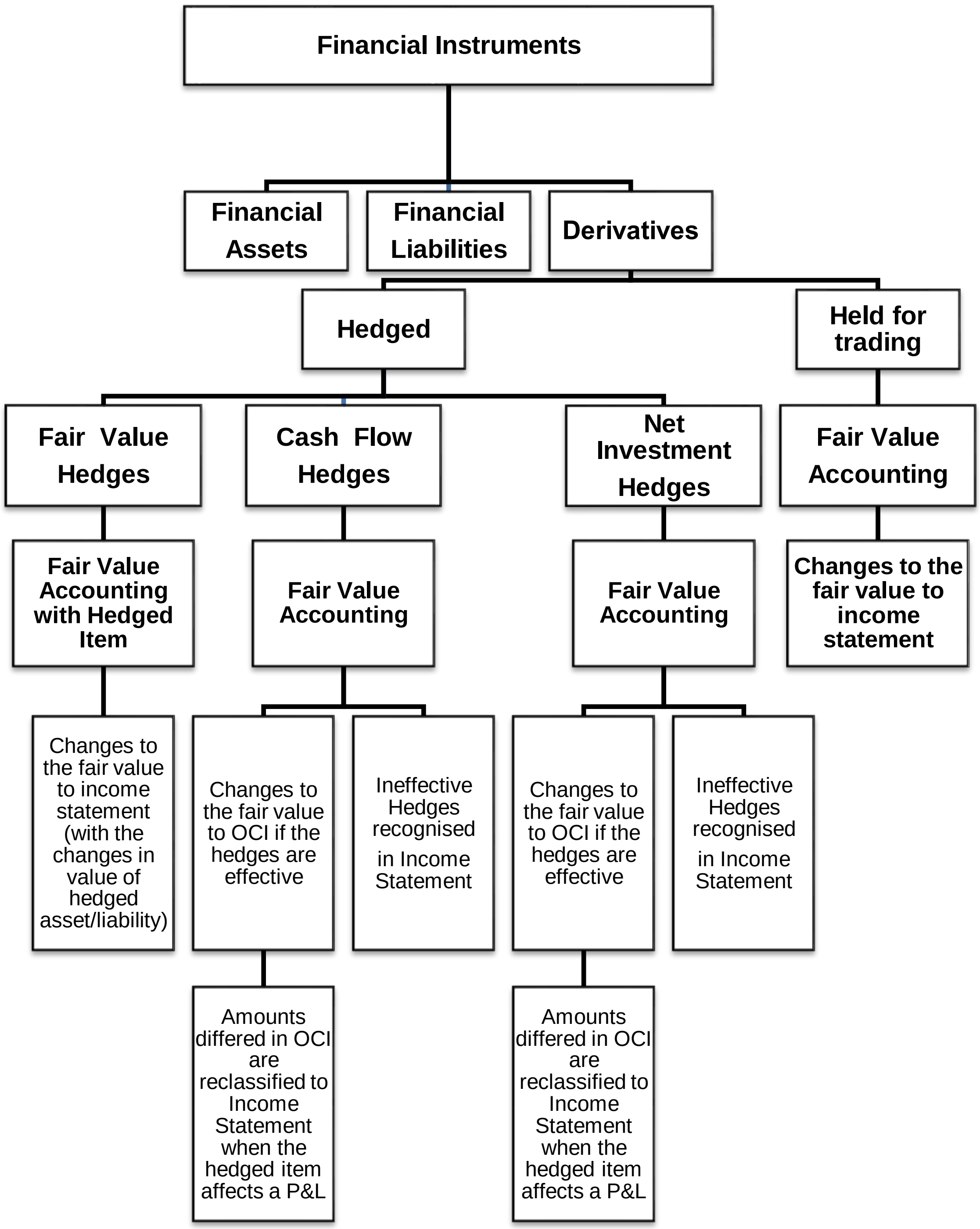


Figure AP 1.2 Current accounting standards of derivatives

AP 1.7.2 Fair Value

At the heart of the financial instruments disclosure and reporting is derivatives measurement, which relies on the concept of fair value. In May 2011 the International Accounting Standards Board therefore issued IFRS 13 *Fair Value Measurement,* which replaced the requirements contained in previous individual standards[55]. This section will examine the important concepts behind fair value.

IFRS 13 *Fair Value Measurement* explains the main economic rationale for using fair value, to determine the value of the derivatives positions and how fair value should be obtained. Fair value is a market-based measurement and is not specific to the relevant entity; hence the objective of a fair value measurement is to estimate the price at which an orderly transaction to sell the asset or to transfer the liability would take place between market participants at the measurement date under current market conditions without considering the availability of observable market transactions and market information about the derivatives – i.e. an exit price at the measurement date from the perspective of a market participant that holds the asset or owes the liability. This is achieved by allowing entities to measure fair value using another valuation technique that maximises the use of relevant observable inputs and minimises the use of unobservable inputs. Furthermore, fair value measurement assumes that the transaction to sell the asset or transfer the liability takes place either in the principal market for the asset or liability or in the most advantageous market for the asset or liability in the event of the absence of a principal market.

Another important concept of the fair value is that even though the transaction price is the price paid to acquire the liability (the entry price), in contrast the fair value is the exit price which the asset or liability being sold would achieve. Furthermore, this must not include the transaction and other costs such as transportation costs, and must be purely based on the asset or the liability. Additionally in a situation where the transaction price might not represent the true fair value of an asset or a liability at

[55] IFRS 13. Para IN3: The IFRS is to be applied for annual periods beginning on or after 1 January 2013. Earlier application is permitted.

initial recognition, the firm shall recognise the resulting gain or loss in its profit and loss statement unless that IFRS specifies otherwise.

AP 1.7.3 Fair Value Hierarchy

In order to increase comparability and consistency in fair value measurements including the related disclosures, IFRS 13 establishes a fair value hierarchy that categorises into three different levels based on the inputs used to measure fair value.

AP 1.7.3.1 Level 1 Inputs

Level 1 inputs refer to the unadjusted quoted prices in active markets for identical assets or liabilities that the entity can access at the measurement date.

AP 1.7.3.2 Level 2 Inputs

Level 2 inputs refer to the inputs other than quoted prices included within Level 1 that are observable either directly or indirectly for the asset or liability.

IFRS 13 Para 82 permits the following as level 2 inputs.

(a) Quoted prices for similar assets or liabilities in active markets.

(b) Quoted prices for identical or similar assets or liabilities in markets that are not active.

(c) Inputs other than quoted prices that are observable for the asset or

liability, for example:

(i) interest rates and yield curves observable at commonly quoted

intervals;

(ii) implied volatilities; and

(iii) credit spreads.

(d) market-corroborated inputs.

AP 1.7.3.3 Level 3 Inputs

Level 3 inputs refer to the unobservable inputs for the asset or liability.

If the relevant observable inputs are not available at the measurement date this allows firms to use unobservable inputs to determine the fair value of their derivative positions. However, the fair value should still reflect the exit price and unobservable inputs should reflect the assumptions that market participants would use when pricing the asset or liability. In addition, entities are permitted to use their own data as Level 3 inputs; nevertheless the entity shall adjust those data afterwards if reasonably available information indicates that other market participants would use different data. If a fair value of an asset or a liability is based on inputs of different levels of the fair value hierarchy, then the fair value measurement is categorised in its entirety in the lowest level input that is significant to the entire measurement.

AP 1.7.4 Hedge Accounting

IFRS 7 para 22 sets out the disclosure requirements for the 3 types of hedges recognised in IAS 39.

An entity shall disclose the following separately for each type of hedge described in IAS 39 (i.e. fair value hedges, cash flow hedges, and hedges of net investments in foreign operations):

(a) a description of each type of hedge;

(b) a description of the financial instruments designated as hedging instruments and their fair values at the end of the reporting period; and

(c) the nature of the risks being hedged.

Section 1.11.4.1 – 1.11.4.5 will illustrate how disclosed derivatives numeric data are calculated and how different types of hedges are being reported under the hedge accounting regime.

AP 1.7.4.1 Fair value hedge

IFRS 7, Para 24 (a) sets out the disclosure requirements for fair value hedges.

An entity shall disclose separately:

(a) in fair value hedges, gains or losses:

(i) on the hedging instrument; and

(ii) on the hedged item attributable to the hedged risk.

Therefore the expectation of a derivative that is disclosed as fair value hedge is to minimise the change in the fair value of the hedged item and the change in the fair value of the derivative, ultimately offsetting the overall effect to the income statement.

A hedge is considered to be perfect if the gain or loss on the fair value of the derivative and that of the hedged asset or liability is equal and offset each other.

The following diagram summarise the fair value hedges with a derivatives instrument

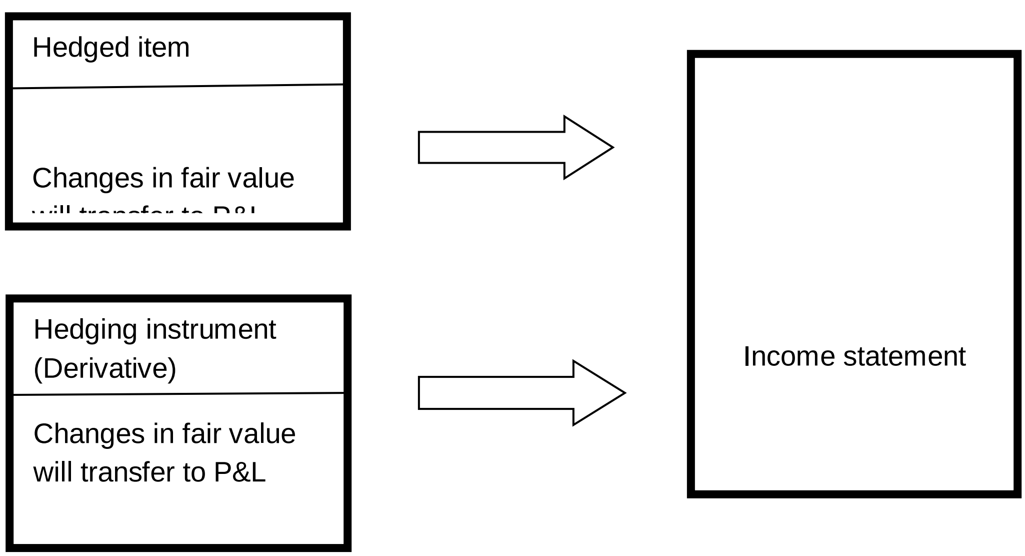


Figure AP 1.3 Fair value hedges

The most common type of fair value hedge is the use of interest rate swaps to hedge the risk arising from changes in the interest rates of debt obligations. The following example illustrates hedge accounting for an interest rate swap.

Assume that Firm A issues £1,000,000 of 5-year 8% fixed rate bonds on the 1st January 2000. But Firm A believes that market interest rates will decline in the future, hence the fair value of the liability will increase and the firm will suffer an economic loss. To protect itself against the interest rate risk, Firm A decides to enter in to a 5-year interest rate swap contract on the same day. The terms of the contract are as follows.

(a) Firm A will receive fixed payments at 8% based on the £1,000,000 notional amount.
(b) Firm A will pay variable rates based on the LIBOR in effect throughout the life of the swap contract. (Assume LIBOR + 3%).

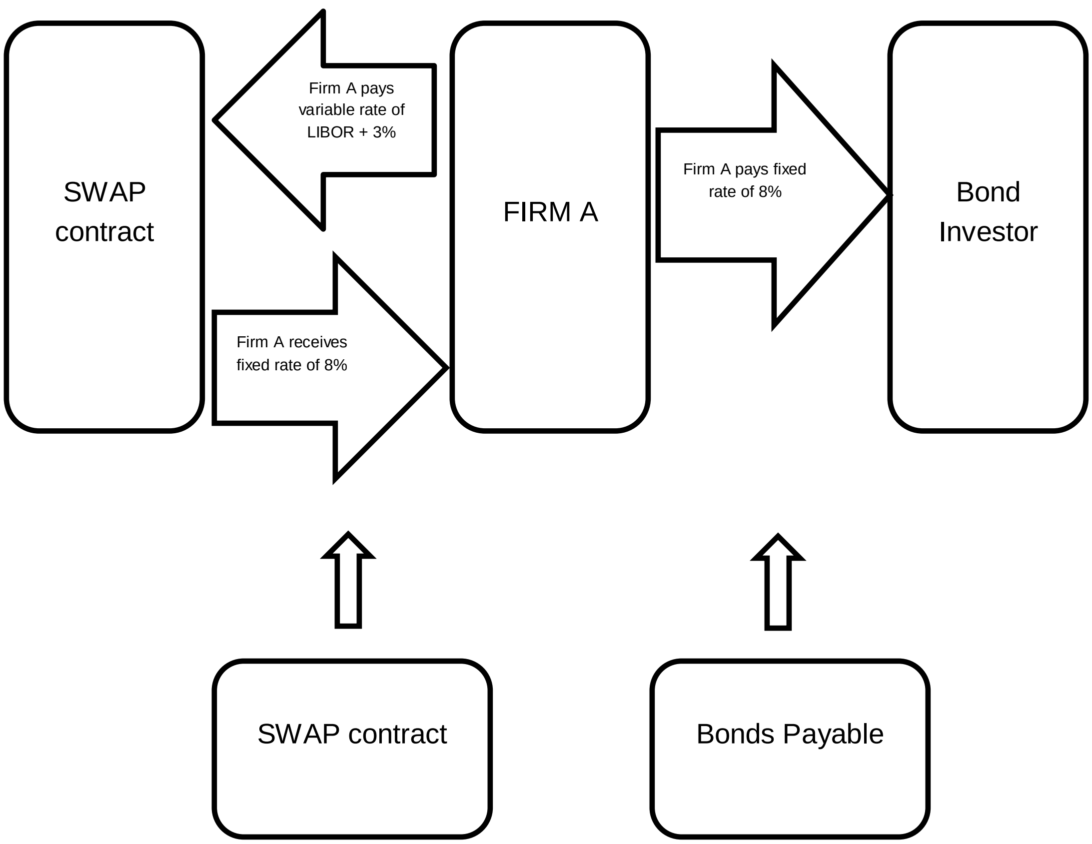


Figure AP 1.4 Example - fair value hedges

The accounting entry would be as follows in the balance sheet.

	Dr	Cr
Cash	£1,000,000	
Bonds Payable		£1,000,000

Firm A formally designates and documents the swap contract as a fair value hedge on 01/01/2000. However the swap contract has no market value at inception assuming that the market conditions didn't change during the course of the day. Therefore Firm A makes no accounting entry to record the swap contract.

On 31st December 2000, Firm A makes the required interest payment on the bond for their bond investors for Year 1.

	Dr	Cr
Interest Expenses (£1,000,000 * 8%)	£80,000	
Cash		£80,000

On each settlement date, Firm A and the counterparty will calculate the difference between current market interest rates and the fixed rate of 8% and determine the value of the swap. If interest rates decline, the value of the swap to Firm A increases, resulting in an economic gain to Firm A. At the end of 2000 market interest rates have declined substantially due to a decrease in LIBOR, hence the value of the swap contract has increased. Firm A will receive a fixed amount of £80,000 (£1,000,000 * 8%) and pay £70,000 for a variable rate of 7% (Assume LIBOR is 4% by 31/12/2000). Firm A will receive therefore £10,000 (£80,000 - £70,000) as a settlement payment on the swap contract on 31st December 2000.

Additionally, Firm A must restate the bond payable to market value and record the change in the market value of the swap contract as a result of the decline in LIBOR.

Let's assume that the independent market valuation shows that the fair value of the interest rate swap has increased by £20,000 and similarly the fair value of the bond decreased by £20,000 due to the LIBOR decrease.

31st December 2000 Income Statement

Loss on Revaluation of Bond Payable[56]	(£20,000)
Gain on Fair value change of the Swap Contract[57]	£20,000
Net gain/loss	£0

In addition to the above income statement entry, the fair value of the bond in the balance sheet will be adjusted with the new fair value of the bond while the fair value of the SWAP contract is recorded in the balance sheet.

31st December 2000 Balance Sheet

	Dr	Cr
Interest Rate Swaps[58]	£20,000	
Bond Payable[59]		£20,000

In the above example, Firm A was able to save £10,000 due to designating the interest rate swap as a fair value hedge benefiting from the falling LIBOR rate.

AP 1.7.4.2 Cash flow hedge

Accounting for cash flow hedges is different to fair value hedges as effective hedges and ineffective hedges are treated differently and separately. IFRS 7, Para 23 sets out the disclosure requirements for cash flow hedges.

56 Changes in fair value of hedged item

57 Changes in fair value of Hedging Instrument

58 In most cases the notional value of the swap contract will be recorded in the notes to the accounts section

59 Hence the total bond payable in the balance sheet would be £1,020,000

For cash flow hedges, an entity shall disclose:

> *(a) the periods when the cash flows are expected to occur and when they are expected to affect profit or loss;*
>
> *(b) a description of any forecast transaction for which hedge accounting had previously been used, but which is no longer expected to occur;*
>
> *(c) the amount that was recognised in other comprehensive income during the period;*
>
> *(d) the amount that was reclassified from equity to profit or loss for the period, showing the amount included in each line item in the statement of comprehensive income; and*
>
> *(e) the amount that was removed from equity during the period and included in the initial cost or other carrying amount of a non-financial asset or non-financial liability whose acquisition or incurrence was a hedged highly probable forecast transaction.*

In addition IFRS 7 Para 24 (b) paid particular attention to ineffective cash flow hedges by making it mandatory to disclose the ineffective portion of the cash flow hedges.

An entity shall disclose separately:

> *(b) the ineffectiveness recognised in profit or loss that arises from cash flow hedges.*

Derivatives used as cash flow hedges are subject to fair value accounting on the balance sheet and the effective portion of the gains or losses are recognised in equity as a part of other comprehensive income. In addition the ineffective portion must be recognised in the income statement immediately.

The following example demonstrates the accounting procedure for cash flow hedges.

Firm A, based in the UK, received an order from its German client on 1st August 2010 to buy 10 million litres of heating oil on 28th February 2011. Firm A expects to receive €12.1 million in February 2011 as a result of this transaction. Firm A wishes to hedge the foreign exchange risk arising from this highly probable forecasted transaction. Firm A therefore enters into a forwards contract on 1st August 2010 to sell €12.1 million on 28th February 2011. The same day Firm A designated the forward contract as a hedging instrument and the forecasted cash flow as the hedged item.

On 31st December 2010, sterling has strengthened against the euro and the currency contract has a fair value of £100,000. Further, Firm A assesses the hedge as being 98% effective, (i.e. a fair value increase of £100,000 in the hedging instrument would be matched by a £98,000 increase in the fair value of the hedged item.

Hence the effective portion of the hedge (£98,000) is credited to equity. The ineffective portion (£2,000) immediately taken to profit and loss. The accounting entries will be as follows.

Firm A Balance Sheet as at 31st December 2010

	Dr	Cr
Derivatives financial Instruments	£100,000	
Equity		£98,000
P & L Account		£2,000

On 28th February 2011, Firm A delivered 10 million litres of heating oil to its client in Germany and received €12.1 million. At the same time Firm A terminated the forward contract, which had a fair value of £104,000 as at 28th February 2011 and received £104,000 cash from the counter party.

The entries to the settlement of the forward contract would be as follows.

	Dr	Cr
Cash	£104,000	
Derivatives Financial Instruments		£104,000

Let's assume that as at 28th February 2011 hedge is fully effective. Since the fair value of the hedge has increased by £4,000 and now the hedge is fully effective the cumulative amount in equity needs to reflect the entire £104,000 increase in fair value. Therefore the accounting entries would be as follows.

	Dr	Cr
Derivatives Financial Instruments	£4,000	
Equity		£6,000
P & L Account	£2,000	

In addition, as the forecast future sale of 10 million litres of heating oil has taken place, the cumulative fair value in the equity must be "recycled" to the P&L.

The accounting entries to the above would be as follows.

	Dr	Cr
Equity	£104,000	
P & L Account		£104,000

The net result of the above transaction would be £2,000 cash profit on the forwards contract, recognised in the P&L for the year ended 31st December 2010 and the remaining £102,000 in the year ended 31st December 2011. In addition, firm A records the receipt of the €12.1 million from its overseas client and (Dr cash, Cr sales) and translates it into sterling at the spot rate for 28th February 2010.

In summary, the accounting for cash flow hedges includes fair value accounting and, if the hedges are effective, changes to the fair value will transfer to other comprehensive income. Ineffective hedges are instantly recognised in the Income Statement. Amounts differed in other comprehensive income are reclassified to the Income Statement when the hedged item results in a profit or a loss.

AP 1.7.4.3 Net Investment Hedges

A net investment hedge may be designated for the net investment in a foreign operation and accounting is similar to cash flow hedges. Gain or loss on the hedging instrument is recorded in equity to offset the translation gain or loss on the net investment as long as the hedge is highly effective. Similar to cash flow hedges, IFRS 7 specifically addressed the ineffective net investment hedges by Paragraph 24 (c).

> *An entity shall disclose separately the ineffectiveness recognised in profit or loss that arises from hedges of net investments in foreign operations.*

AP 1.7.4.4 Held for Trading Derivatives

IFRS 9 Appendix A defines held for trading derivatives as

> *A financial asset or financial liability that is a derivative (except for a derivative that is a financial guarantee contract or a designated and effective hedging instrument).*

Derivatives are always considered to be held for trading, unless they are in a hedging relationship. Furthermore, the held for trading classification is permanent; therefore once a derivative is classified as held for trading it cannot be removed from the category and accounted for differently. Held for trading derivatives are subject to fair value accounting and changes in the fair value are recognised instantly in the income statement.

AP 1.7.4.5 Embedded Derivatives

One of the main reasons for developing new accounting standards for derivatives was the rapid innovation of complex financial instruments. This has led to the implementation of hybrid securities, which have features of both debt and equity. These instruments are often a combination of traditional debt securities and derivatives. For instance, a convertible bond is a hybrid security which comprises a debt security (referred to as the host security, where the holder has a right to receive interest payments) and an option to convert the bond to common shares (embedded derivative).

IFRS 9 Para 4.3 describes an embedded derivative as follows.

> *An embedded derivative is a component of a hybrid contract that also includes a non-derivative host—with the effect that some of the cash flows of the combined instrument vary in a way similar to a stand-alone derivative. To consistent with accounting for other similar derivatives, hybrid security should be separated from the host security and accounting treatment should be carried out using the derivative accounting.*

Appendix 2: Industry Classification Benchmark

AP Table 2.1
Industry Structure

Industry	Supersector	Sector	Subsector	Definition
0001 Oil & Gas	0500 Oil & Gas	0570 Oil Equipment, Services & Distribution	0573 Oil Equipment & Services	Suppliers of equipment and services to oil fields and offshore platforms, such as drilling, exploration, seismic-information services and platform construction.
			0577 Pipelines	Operators of pipelines carrying oil, gas or other forms of fuel. Excludes pipeline operators that derive the majority of their revenues from direct sales to end users, which are classified under Gas Distribution.
		0580 Alternative Energy	0583 Renewable Energy Equipment	Companies that develop or manufacture renewable energy equipment utilizing sources such as solar, wind, tidal, geothermal, hydro and waves.
			0587 Alternative Fuels	Companies that produce alternative fuels such as ethanol, methanol, hydrogen and bio-fuels that are mainly used to power vehicles, and companies that are involved in the production of vehicle fuel cells and/or the development of alternative fuelling infrastructure.
1000 Basic Materials	1300 Chemicals	1350 Chemicals	1353 Commodity Chemicals	Producers and distributors of simple chemical products that are primarily used to formulate more complex chemicals or products, including plastics and rubber in their raw form, fiberglass and synthetic fibers.
			1357 Specialty Chemicals	Producers and distributors of finished chemicals for industries or end users, including dyes, cellular polymers, coatings, special plastics and other chemicals for specialized applications. Includes makers of colorings, flavors and fragrances, fertilizers, pesticides, chemicals used to make drugs, paint in its pigment form and glass in its unfinished form. Excludes producers of paint and glass products used for construction, which are classified under Building Materials & Fixtures.
	1700 Basic Resources	1730 Forestry & Paper	1733 Forestry	Owners and operators of timber tracts, forest tree nurseries and sawmills. Excludes providers of finished wood products such as wooden beams, which are classified under Building Materials & Fixtures.
			1737 Paper	Producers, converters, merchants and distributors of all grades of paper. Excludes makers of printed forms, which are classified under Business Support Services, and manufacturers of paper items such as cups and napkins, which are classified under Nondurable Household Products.
		1750 Industrial Metals & Mining	1753 Aluminum	Companies that mine or process bauxite or manufacture and distribute aluminum bars, rods and other products for use by other industries. Excludes manufacturers of finished aluminum products, such as siding, which are categorized according to the type of end product.
			1755 Nonferrous Metals	Producers and traders of metals and primary metal products other than iron, aluminum and steel. Excludes companies that make finished products, which are categorized according to the type of end product.
			1757 Iron & Steel	Manufacturers and stockholders of primary iron and steel products such as pipes, wires, sheets and bars, encompassing all processes from smelting in blast furnaces to rolling mills and foundries. Includes companies that primarily mine iron ores.
		1770 Mining	1771 Coal	Companies engaged in the exploration for or mining of coal.
			1773 Diamonds & Gemstones	Companies engaged in the exploration for and production of diamonds and other gemstones.
			1775 General Mining	Companies engaged in the exploration, extraction or refining of minerals not defined elsewhere within the Mining sector.
			1777 Gold Mining	Prospectors for and extractors or refiners of gold-bearing ores.

			1779 Platinum & Precious Metals	Companies engaged in the exploration for and production of platinum, silver and other precious metals not defined elsewhere.
2000 Industrials	2300 Construction & Materials	2350 Construction & Materials	2353 Building Materials & Fixtures	Producers of materials used in the construction and refurbishment of buildings and structures, including cement and other aggregates, wooden beams and frames, paint, glass, roofing and flooring materials other than carpets. Includes producers of bathroom and kitchen fixtures, plumbing supplies and central air-conditioning and heating equipment. Excludes producers of raw lumber, which are classified under Forestry.
			2357 Heavy Construction	Companies engaged in the construction of commercial buildings, infrastructure such as roads and bridges, residential apartment buildings, and providers of services to construction companies, such as architects, masons, plumbers and electrical contractors.
	2700 Industrial Goods & Services	2710 Aerospace & Defence	2713 Aerospace	Manufacturers, assemblers and distributors of aircraft and aircraft parts primarily used in commercial or private air transport. Excludes manufacturers of communications satellites, which are classified under Telecommunications Equipment.
			2717 Defence	Producers of components and equipment for the defense industry, including military aircraft, radar equipment and weapons.
		2720 General Industrials	2723 Containers & Packaging	Makers and distributors of cardboard, bags, boxes, cans, drums, bottles and jars and glass used for packaging.
			2727 Diversified Industrials	Industrial companies engaged in three or more classes of business within the Industrial industry that differ substantially from each other.
		2730 Electronic & Electrical Equipment	2733 Electrical Components & Equipment	Makers and distributors of electrical parts for finished products, such as printed circuit boards for radios, televisions and other consumer electronics. Includes makers of cables, wires, ceramics, transistors, electric adapters and security cameras.
			2737 Electronic Equipment	Manufacturers and distributors of electronic products used in different industries. Includes makers of lasers, smart cards, bar scanners, fingerprinting equipment and other electronic factory equipment.
		2750 Industrial Engineering	2753 Commercial Vehicles & Trucks	Manufacturers and distributors of commercial vehicles and heavy agricultural and construction machinery, including rail cars, tractors, bulldozers, cranes, buses and industrial lawn mowers. Includes non-military shipbuilders, such as builders of cruise ships and ferries.
			2757 Industrial Machinery	Designers, manufacturers, distributors and installers of industrial machinery and factory equipment, such as machine tools, lathes, presses and assembly line equipment. Includes makers of pollution control equipment, castings, pressings, welded shapes, structural steelwork, compressors, pumps, bearings, elevators and escalators.
		2770 Industrial Transportation	2771 Delivery Services	Operators of mail and package delivery services for commercial and consumer use. Includes courier and logistic services primarily involving air transportation.
			2773 Marine Transportation	Providers of on-water transportation for commercial markets, such as container shipping. Excludes ports, which are classified under Transportation Services, and shipbuilders, which are classified under Commercial Vehicles & Trucks.
			2775 Railroads	Providers of industrial railway transportation and railway lines. Excludes passenger railway companies, which are classified under Travel & Tourism, and manufacturers of rail cars, which are classified under Commercial Vehicles & Trucks.
			2777 Transportation Services	Companies providing services to the Industrial Transportation sector, including companies that manage airports, train depots, roads, bridges, tunnels, ports, and providers of logistic services to shippers of goods. Includes companies that provide aircraft and vehicle maintenance services.
			2779 Trucking	Companies that provide commercial trucking services. Excludes road and tunnel operators, which are classified under Transportation Services, and vehicle rental and taxi companies, which are classified under Travel & Tourism.
		2790 Support Services	2791 Business Support Services	Providers of nonfinancial services to a wide range of industrial enterprises and governments. Includes providers of printing services, management consultants, office cleaning services, and companies that install, service and monitor alarm and security systems.

			2793 Business Training & Employment Agencies	Providers of business or management training courses and employment services.
			2795 Financial Administration	Providers of computerized transaction processing, data communication and information services, including payroll, bill payment and employee benefit services.
			2797 Industrial Suppliers	Distributors and wholesalers of diversified products and equipment primarily used in the commercial and industrial sectors. Includes builders merchants.
			2799 Waste & Disposal Services	Providers of pollution control and environmental services for the management, recovery and disposal of solid and hazardous waste materials, such as landfills and recycling centers. Excludes manufacturers of industrial air and water filtration equipment, which are classified under Industrial Machinery.
3000 Consumer Goods	3300 Automobiles & Parts	3350 Automobiles & Parts	3353 Automobiles	Makers of motorcycles and passenger vehicles, including cars, sport utility vehicles (SUVs) and light trucks. Excludes makers of heavy trucks, which are classified under Commercial Vehicles & Trucks, and makers of recreational vehicles (RVs and ATVs), which are classified under Recreational Products.
			3355 Auto Parts	Manufacturers and distributors of new and replacement parts for motorcycles and automobiles, such as engines, carburetors and batteries. Excludes producers of tires, which are classified under Tires.
			3357 Tires	Manufacturers, distributors and retreaders of automobile, truck and motorcycle tires.
	3500 Food & Beverage	3530 Beverages	3533 Brewers	Manufacturers and shippers of cider or malt products such as beer, ale and stout.
			3535 Distillers & Vintners	Producers, distillers, vintners, blenders and shippers of wine and spirits such as whisky, brandy, rum, gin or liqueurs.
			3537 Soft Drinks	Manufacturers, bottlers and distributors of non-alcoholic beverages, such as soda, fruit juices, tea, coffee and bottled water.
		3570 Food Producers	3573 Farming, Fishing & Plantations	Companies that grow crops or raise livestock, operate fisheries or own nontobacco plantations. Includes manufacturers of livestock feeds and seeds and other agricultural products but excludes manufacturers of fertilizers or pesticides, which are classified under Specialty Chemicals.
			3577 Food Products	Food producers, including meatpacking, snacks, fruits, vegetables, dairy products and frozen seafood. Includes producers of pet food and manufacturers of dietary supplements, vitamins and related items. Excludes producers of fruit juices, tea, coffee, bottled water and other non-alcoholic beverages, which are classified under Soft Drinks.
	3700 Personal & Household Goods	3720 Household Goods & Home Construction	3722 Durable Household Products	Manufacturers and distributors of domestic appliances, lighting, hand tools and power tools, hardware, cutlery, tableware, garden equipment, luggage, towels and linens.
			3724 Nondurable Household Products	Producers and distributors of pens, paper goods, batteries, light bulbs, tissues, toilet paper and cleaning products such as soaps and polishes.
			3726 Furnishings	Manufacturers and distributors of furniture, including chairs, tables, desks, carpeting, wallpaper and office furniture.
			3728 Home Construction	Constructors of residential homes, including manufacturers of mobile and prefabricated homes intended for use in one place.
		3740 Leisure Goods	3743 Consumer Electronics	Manufacturers and distributors of consumer electronics, such as TVs, VCRs, DVD players, audio equipment, cable boxes, calculators and camcorders.
			3745 Recreational Products	Manufacturers and distributors of recreational equipment. Includes musical instruments, photographic equipment and supplies, RVs, ATVs and marine recreational vehicles such as yachts, dinghies and speedboats.
			3747 Toys	Manufacturers and distributors of toys and video/computer games, including such toys and games as playing cards, board games, stuffed animals and dolls.

		3760 Personal Goods	3763 Clothing & Accessories	Manufacturers and distributors of all types of clothing, jewelry, watches or textiles. Includes sportswear, sunglasses, eyeglass frames, leather clothing and goods, and processors of hides and skins.
			3765 Footwear	Manufacturers and distributors of shoes, boots, sandals, sneakers and other types of footwear.
			3767 Personal Products	Makers and distributors of cosmetics, toiletries and personal-care and hygiene products, including deodorants, soaps, toothpaste, perfumes, diapers, shampoos, razors and feminine-hygiene products. Includes makers of contraceptives other than oral contraceptives, which are classified under Pharmaceuticals.
		3780 Tobacco	3785 Tobacco	Manufacturers and distributors of cigarettes, cigars and other tobacco products. Includes tobacco plantations.
4000 Health Care	4500 Health Care	4530 Health Care Equipment & Services	4533 Health Care Providers	Owners and operators of health maintenance organizations, hospitals, clinics, dentists, opticians, nursing homes, rehabilitation and retirement centers. Excludes veterinary services, which are classified under Specialized Consumer Services.
			4535 Medical Equipment	Manufacturers and distributors of medical devices such as MRI scanners, prosthetics, pacemakers, X-ray machines and other non-disposable medical devices.
			4537 Medical Supplies	Manufacturers and distributors of medical supplies used by health care providers and the general public. Includes makers of contact lenses, eyeglass lenses, bandages and other disposable medical supplies.
		4570 Pharmaceuticals & Biotechnology	4573 Biotechnology	Companies engaged in research into and development of biological substances for the purposes of drug discovery and diagnostic development, and which derive the majority of their revenue from either the sale or licensing of these drugs and diagnostic tools.
			4577 Pharmaceuticals	Manufacturers of prescription or over-the-counter drugs, such as aspirin, cold remedies and birth control pills. Includes vaccine producers but excludes vitamin producers, which are classified under Food Products.
5000 Consumer Services	5300 Retail	5330 Food & Drug Retailers	5333 Drug Retailers	Operators of pharmacies, including wholesalers and distributors catering to these businesses.
			5337 Food Retailers & Wholesalers	Supermarkets, food-oriented convenience stores and other food retailers and distributors. Includes retailers of dietary supplements and vitamins.
		5370 General Retailers	5371 Apparel Retailers	Retailers and wholesalers specializing mainly in clothing, shoes, jewelry, sunglasses and other accessories.
			5373 Broadline Retailers	Retail outlets and wholesalers offering a wide variety of products including both hard goods and soft goods.
			5375 Home Improvement Retailers	Retailers and wholesalers concentrating on the sale of home improvement products, including garden equipment, carpets, wallpaper, paint, home furniture, blinds and curtains, and building materials.
			5377 Specialized Consumer Services	Providers of consumer services such as auction houses, day-care centers, dry cleaners, schools, consumer rental companies, veterinary clinics, hair salons and providers of funeral, lawn-maintenance, consumer-storage, heating and cooling installation and plumbing services.
			5379 Specialty Retailers	Retailers and wholesalers concentrating on a single class of goods, such as electronics, books, automotive parts or closeouts. Includes automobile dealerships, video rental stores, dollar stores, duty-free shops and automotive fuel stations not owned by oil companies.
	5500 Media	5550 Media	5553 Broadcasting & Entertainment	Producers, operators and broadcasters of radio, television, music and filmed entertainment. Excludes movie theatres, which are classified under Recreational Services.
			5555 Media Agencies	Companies providing advertising, public relations and marketing services. Includes billboard providers and telemarketers.

			5557 Publishing	Publishers of information via printed or electronic media.
	5700 Travel & Leisure	5750 Travel & Leisure	5751 Airlines	Companies providing primarily passenger air transport. Excludes airports, which are classified under Transportation Services.
			5752 Gambling	Providers of gambling and casino facilities. Includes online casinos, racetracks and the manufacturers of pachinko machines and casino and lottery equipment.
			5753 Hotels	Operators and managers of hotels, motels, lodges, resorts, spas and campgrounds.
			5755 Recreational Services	Providers of leisure facilities and services, including fitness centers, cruise lines, movie theatres and sports teams.
			5757 Restaurants & Bars	Operators of restaurants, fast-food facilities, coffee shops and bars. Includes integrated brewery companies and catering companies.
			5759 Travel & Tourism	Companies providing travel and tourism related services, including travel agents, online travel reservation services, automobile rental firms and companies that primarily provide passenger transportation, such as buses, taxis, passenger rail and ferry companies.
6000 Telecommunications	6500 Telecommunications	6530 Fixed Line Telecommunications	6535 Fixed Line Telecommunications	Providers of fixed-line telephone services, including regional and long-distance. Includes companies that primarily provides telephone services through the internet. Excludes companies whose primary business is Internet access, which are classified under Internet.
		6570 Mobile Telecommunications	6575 Mobile Telecommunications	Providers of mobile telephone services, including cellular, satellite and paging services. Includes wireless tower companies that own, operate and lease mobile site towers to multiple wireless service providers.
7000 Utilities	7500 Utilities	7530 Electricity	7535 Conventional Electricity	Companies generating and distributing electricity through the burning of fossil fuels such as coal, petroleum and natural gas, and through nuclear energy.
			7537 Alternative Electricity	Companies generating and distributing electricity from a renewable source. Includes companies that produce solar, water, wind and geothermal electricity.
		7570 Gas, Water & Multi-utilities	7573 Gas Distribution	Distributors of gas to end users. Excludes providers of natural gas as a commodity, which are classified under the Oil & Gas industry.
			7575 Multi-utilities	Utility companies with significant presence in more than one utility.
			7577 Water	Companies providing water to end users, including water treatment plants.
8000 Financials	8300 Banks	8350 Banks	8355 Banks	Banks providing a broad range of financial services, including retail banking, loans and money transmissions.
	8500 Insurance	8530 Nonlife Insurance	8532 Full Line Insurance	Insurance companies with life, health, property & casualty and reinsurance interests, no one of which predominates.
			8534 Insurance Brokers	Insurance brokers and agencies.
			8536 Property & Casualty Insurance	Companies engaged principally in accident, fire, automotive, marine, malpractice and other classes of nonlife insurance.
			8538 Reinsurance	Companies engaged principally in reinsurance.
		8570 Life Insurance	8575 Life Insurance	Companies engaged principally in life and health insurance.
	8600 Real Estate	8630 Real Estate Investment & Services	8633 Real Estate Holding & Development	Companies that invest directly or indirectly in real estate through development, investment or ownership. Excludes real estate investment trusts and similar entities, which are classified as Real Estate Investment Trusts.
			8637 Real Estate Services	Companies that provide services to real estate companies but do not own the properties themselves. Includes agencies, brokers, leasing companies, management companies and advisory services. Excludes real estate investment trusts and similar entities, which are classified as Real Estate Investment Trusts.

		8670 Real Estate Investment Trusts	8671 Industrial & Office REITs	Real estate investment trusts or corporations (REITs) or listed property trusts (LPTs) that primarily invest in office, industrial and flex properties.
			8672 Retail REITs	Real estate investment trusts or corporations (REITs) or listed property trusts (LPTs) that primarily invest in retail properties. Includes malls, shopping centers, strip centers and factory outlets.
			8673 Residential REITs	Real estate investment trusts or corporations (REITs) or listed property trusts (LPTs) that primarily invest in residential home properties. Includes apartment buildings and residential communities.
			8674 Diversified REITs	Real estate investment trusts or corporations (REITs) or listed property trusts (LPTs) that invest in a variety of property types without a concentration on any single type.
			8675 Specialty REITs	Real estate investment trusts or corporations (REITs) or listed property trusts (LPTs) that invest in self storage properties, properties in the health care industry such as hospitals, assisted living facilities and health care laboratories, and other specialized properties such as auto dealership facilities, timber properties and net lease properties.
			8676 Mortgage REITs	Real estate investment trusts or corporations (REITs) or listed property trusts (LPTs) that are directly involved in lending money to real estate owners and operators or indirectly through the purchase of mortgages or mortgage backed securities.
			8677 Hotel & Lodging REITs	Real estate investment trusts or corporations (REITs) or listed property trusts (LPTs) that primarily invest in hotels or lodging properties.
	8700 Financial Services	8770 Financial Services	8771 Asset Managers	Companies that provide custodial, trustee and other related fiduciary services. Includes mutual fund management companies.
			8773 Consumer Finance	Credit card companies and providers of personal finance services such as personal loans and check cashing companies.
			8775 Specialty Finance	Companies engaged in financial activities not specified elsewhere. Includes companies not classified under Equity Investment Instruments or Nonequity Investment Instruments engaged primarily in owning stakes in a diversified range of companies.
			8777 Investment Services	Companies providing a range of specialized financial services, including securities brokers and dealers, online brokers and security or commodity exchanges.
			8779 Mortgage Finance	Companies that provide mortgages, mortgage insurance and other related services.
		8980 Equity Investment Instruments	8985 Equity Investment Instruments	Corporate closed-ended investment entities identified under distinguishing legislation, such as investment trusts and venture capital trusts.
		8990 Nonequity Investment Instruments	8995 Nonequity Investment Instruments	Cash shells, Special Purpose Acquisition Company (SPACs), Noncorporate, open-ended investment instruments such as open-ended investment companies and funds, unit trusts, ETFs and currency funds and split capital trusts.
9000 Technology	9500 Technology	9530 Software & Computer Services	9533 Computer Services	Companies that provide consulting services to other businesses relating to information technology. Includes providers of computer-system design, systems integration, network and systems operations, data management and storage, repair services and technical support.
			9535 Internet	Companies providing Internet-related services, such as Internet access providers and search engines and providers of Web site design, Web hosting, domain-name registration and e-mail services.
			9537 Software	Publishers and distributors of computer software for home or corporate use. Excludes computer game producers, which are classified under Toys.
		9570 Technology Hardware & Equipment	9572 Computer Hardware	Manufacturers and distributors of computers, servers, mainframes, workstations and other computer hardware and subsystems, such as mass-storage drives, mice, keyboards and printers.
			9574 Electronic Office Equipment	Manufacturers and distributors of electronic office equipment, including photocopiers and fax machines.
			9576 Semiconductors	Producers and distributors of semiconductors and other integrated chips, including other products related to the semiconductor industry, such as semiconductor capital

		equipment and motherboards. Excludes makers of printed circuit boards, which are classified under Electrical Components & Equipment.
9578	Telecommunications Equipment	Makers and distributors of high-technology communication products, including satellites, mobile telephones, fibers optics, switching devices, local and wide-area networks, teleconferencing equipment and connectivity devices for computers, including hubs and routers.

Appendix 3: Industry Analysis

AP 3.1.1 FTSE 100 Fair values of the total derivatives assets and liabilities

Table AP 3.1

Fair values of the total derivatives assets and liabilities - FTSE 100

	Derivatives Assets (£m)				Derivatives Liabilities (£m)			
Year	**N**	**sum**	**mean**	**Sd**	**N**	**sum**	**mean**	**Sd**
2005	60	32,469.4	541.2	2,370.5	60	(35,735.6)	(595.6)	2,543.5
2006	66	24,460.1	370.6	1,511.1	65	(27,014.8)	(415.6)	1,548.3
2007	67	27,095.3	404.4	1,374.4	70	(29,192.6)	(417.0)	1,415.7
2008	68	67,580.3	993.8	3,606.4	72	(64,981.8)	(902.5)	3,435.8
2009	68	38,567.6	567.2	1,692.9	74	(35,146.0)	(474.9)	1,516.7
2010	69	39,143.3	567.3	1,785.1	72	(34,912.5)	(484.9)	1,712.0
2011	69	37,603.8	545.0	1,581.0	73	(31,702.2)	(434.3)	1,382.9
2012	72	33,920.9	471.1	1,108.2	72	(23,043.0)	(320.0)	848.6

AP 3.1.2 FTSE 250 Fair values of the total derivatives assets and liabilities

Table AP 3.2

Fair values of the total derivatives assets and liabilities - FTSE 250

	Derivatives Assets (£m)				Derivatives Liabilities (£m)			
Year	**N**	**Sum**	**mean**	**Sd**	**N**	**sum**	**mean**	**Sd**
2005	63	233.5	3.70	8.42	67	(904.2)	(13.5)	31.5
2006	83	653.7	7.88	38.6	78	(900.6)	(11.5)	22.7
2007	82	797.5	9.73	22.1	91	(1,717.8)	(18.9)	49.2
2008	81	2,135.4	26.4	66.6	102	(3,841.0)	(37.7)	76.3
2009	86	1,382.6	16.1	49.3	109	(3,158.5)	(29.0)	76.0
2010	83	1,265.5	15.2	28.9	107	(2,236.1)	(20.9)	37.7
2011	86	1,394.3	16.2	30.4	110	(2,359.8)	(21.5)	45.1
2012	84	1,074.6	12.8	21.8	105	(2,290.2)	(21.8)	51.5

AP 3.2 Total number of firms in each industry

Table AP 3.3

FTSE 350, FTSE 100 and FTSE 250 total number of firms in each industry

FTSE 350

	Basic Materials	Consumer Goods	Consumer Services	Healthcare	Industrials	Oil & Gas	Technology	Telecommunications	Utilities
2005	18	23	52	10	64	12	14	7	6
2006	21	23	54	10	65	14	15	8	6
2007	22	23	56	10	65	14	15	8	6
2008	23	24	56	10	65	15	15	8	6
2009	25	24	57	10	65	17	15	8	6
2010	26	24	59	10	65	17	15	8	6
2011	28	24	59	11	65	17	15	8	6
2012	28	24	59	11	65	17	15	8	6

FTSE 100

	Basic Materials	Consumer Goods	Consumer Services	Healthcare	Industrials	Oil & Gas	Technology	Telecommunications	Utilities
2005	9	9	16	4	17	6	2	2	5
2006	10	9	16	4	17	6	2	2	5
2007	10	9	17	4	17	6	2	2	5
2008	11	9	17	4	17	6	2	2	5
2009	11	9	17	4	17	6	2	2	5
2010	11	9	18	4	17	6	2	2	5
2011	13	9	18	4	17	6	2	2	5
2012	13	9	18	4	17	6	2	2	5

FTSE 250

	Basic Materials	Consumer Goods	Consumer Services	Healthcare	Industrials	Oil & Gas	Technology	Telecommunications	Utilities
2005	9	14	36	6	47	6	12	5	1
2006	11	14	38	6	48	8	13	6	1
2007	12	14	39	6	48	8	13	6	1
2008	12	15	39	6	48	9	13	6	1
2009	14	15	40	6	48	11	13	6	1
2010	15	15	41	6	48	11	13	6	1
2011	15	15	41	7	48	11	13	6	1
2012	15	15	41	7	48	11	13	6	1

AP 3.3 Proportion of derivatives users under different industries

Table AP 3.4

Proportion of derivatives users by industry - FTSE 350, FTSE 100 and FTSE 250.

	FTSE 350		FTSE 100		FTSE 250	
Industry	**No of derivatives users**	**Derivatives user percentage (%)**	**No of derivatives users**	**Derivatives user percentage (%)**	**No of derivatives users**	**Derivatives user percentage (%)**
Basic Materials						
2005	13	72.2	9	100.0	4	44.4
2006	14	66.7	9	90.0	5	45.5
2007	17	77.3	10	100.0	7	58.3
2008	19	82.6	10	90.9	9	75.0
2009	18	72.0	10	90.9	8	57.1
2010	19	73.1	9	81.8	10	66.7
2011	20	71.4	10	76.9	10	66.7
2012	19	67.9	10	76.9	9	60.0
Consumer Goods						
2005	18	78.3	9	100.0	9	64.3
2006	18	78.3	9	100.0	9	64.3
2007	19	82.6	9	100.0	10	71.4
2008	21	87.5	9	100.0	12	80.0
2009	22	91.7	9	100.0	13	86.7
2010	22	91.7	9	100.0	13	86.7
2011	20	83.3	9	100.0	11	73.3
2012	19	79.2	9	100.0	10	66.7
Consumer Services						
2005	38	73.1	14	87.5	24	66.7
2006	45	83.3	16	100.0	29	76.3
2007	46	82.1	17	100.0	29	74.4
2008	47	83.9	17	100.0	30	76.9
2009	48	84.2	17	100.0	31	77.5
2010	47	79.7	18	100.0	29	70.7
2011	46	78.0	18	100.0	28	68.3
2012	43	72.9	18	100.0	25	61.0
Healthcare						
2005	7	70.0	4	100.0	3	50.0
2006	10	100.0	4	100.0	6	100.0
2007	10	100.0	4	100.0	6	100.0
2008	10	100.0	4	100.0	6	100.0
2009	10	100.0	4	100.0	6	100.0
2010	10	100.0	4	100.0	6	100.0
2011	11	100.0	4	100.0	7	100.0
2012	11	100.0	4	100.0	7	100.0
Industrials						
2005	47	73.4	16	94.1	31	66.0
2006	52	80.0	17	100.0	35	72.9
2007	54	83.1	17	100.0	37	77.1
2008	58	89.2	17	100.0	41	85.4
2009	57	87.7	17	100.0	40	83.3
2010	56	86.2	17	100.0	39	81.3
2011	58	89.2	16	94.1	42	87.5
2012	57	87.7	16	94.1	41	85.4
Oil & Gas						
2005	8	66.7	6	100.0	2	33.3
2006	10	71.4	6	100.0	4	50.0

2007	11	78.6	6	100.0	5	62.5
2008	13	86.7	6	100.0	7	77.8
2009	11	64.7	6	100.0	5	45.5
2010	11	64.7	6	100.0	5	45.5
2011	12	70.6	5	83.3	7	63.6
2012	12	70.6	5	83.3	7	63.6
Technology						
2005	9	64.3	1	50.0	8	66.7
2006	11	73.3	1	50.0	10	76.9
2007	10	66.7	1	50.0	9	69.2
2008	11	73.3	1	50.0	10	76.9
2009	11	73.3	2	100.0	9	69.2
2010	11	73.3	2	100.0	9	69.2
2011	9	60.0	1	50.0	8	61.5
2012	10	66.7	2	100.0	8	61.5
Telecommunications						
2005	5	71.4	2	100.0	3	60.0
2006	6	75.0	2	100.0	4	66.7
2007	6	75.0	2	100.0	4	66.7
2008	5	62.5	2	100.0	3	50.0
2009	5	62.5	2	100.0	3	50.0
2010	5	62.5	2	100.0	3	50.0
2011	5	62.5	2	100.0	3	50.0
2012	6	75.0	2	100.0	4	66.7
Utilities						
2005	6	100.0	5	100.0	1	100.0
2006	6	100.0	5	100.0	1	100.0
2007	6	100.0	5	100.0	1	100.0
2008	6	100.0	5	100.0	1	100.0
2009	6	100.0	5	100.0	1	100.0
2010	6	100.0	5	100.0	1	100.0
2011	6	100.0	5	100.0	1	100.0
2012	6	100.0	5	100.0	1	100.0

Table AP 3.4 shows the proportion of derivatives users by different industries. It shows that derivatives use is common practice irrespective of the industry or the size of the firm. Further, it shows that the use of derivatives across industries varies considerably, a finding also reported by Bodnar *et al.* (1995). They suggested that traditional commodity-based industries, including agriculture, refining, and mining, showed the highest usage in their sample.

All FTSE 100 firms in the consumer goods, healthcare, telecommunications and utilities industries used derivatives throughout the study period and all FTSE 250 firms in the utilities sector used derivatives. However, there was a declining trend of derivatives use in the FTSE 100 firms listed as basic materials. In smaller basic materials firms this declining trend began after the 2008 financial crisis; whereas before the financial crisis there was a steady increase of number of firms using derivatives. The proportion of FTSE 250 firms using derivatives in consumer goods industry fluctuated between 64.3% and 86.7%; in FTSE 250 consumer services and technology sectors it varied between 61% and 77.5%. Further, all FTSE 100 consumer services firms and FTSE 250 healthcare industries used derivatives from 2006-2012. One possible explanation for this lower proportion in some industries in 2005 could be that these firms delayed adopting IFRS 7, as the adoption of IFRS 7 was only mandated from 1 January 2007.

Further, most FTSE 100 and FTSE 250 non-financial firms were in either consumer services or industrial sectors (Table 3.4). Within these sectors, the proportion of derivatives user firms in industrials in the FTSE 100 was around 94%. In FTSE 250 firms this varied between 66% and 87.5%. The variations in proportion of derivatives users in the FTSE 100 technology and FTSE 250 telecommunications sectors were between 50% and 100%. However, due to the small number of firms involved, these numbers should be interpreted with caution.

Several previous studies have examined extensively derivatives use in the oil and gas industry. In the current study, the percentage of derivative users in the large oil and gas firms were between 83.3% and 100%. However, compared to large firms, the percentage of small firms using derivatives was low; in 2005, this figure was as low as 33.3%, rising to 77.8% in 2008. The findings are consistent with previous studies (see Chapter 2 – *Literature review* for detailed list of literature); it provides evidence supporting the argument that large firms tend to use derivatives more than their smaller counterparts. Unlike previous studies, this study examines all non-financial industries represented in FTSE 350 firms, and provides evidence that large firms are more prone to using derivatives. Previous studies were limited to one or two sectors in a particular market.

AP 3.4 Distribution of total absolute fair values of derivatives among industries

Table AP 3.5

Distribution of derivatives fair values proportions across different industries

FTSE 100 fair value proportions

Year	Basic Materials	Consumer Goods	Consumer Services	Healthcare	Industrials	Oil & Gas	Technology	Telecom	Utilities
2005	3.78	2.81	2.40	0.66	2.23	76.9	0.00	2.63	8.64
2006	5.07	3.07	3.71	0.69	3.26	69.8	0.00	3.80	10.6
2007	6.83	4.80	4.78	1.55	3.74	58.1	0.00	5.36	14.8
2008	5.40	3.88	4.92	1.78	6.02	60.0	0.02	5.26	12.7
2009	6.42	5.41	7.54	0.90	5.80	49.8	0.01	7.14	17.0
2010	6.18	5.36	6.78	0.90	5.92	52.6	0.01	5.52	16.7
2011	7.43	5.62	8.40	0.89	6.05	48.9	0.00	8.60	14.1
2012	8.43	7.01	10.4	0.81	5.33	39.1	0.13	11.4	17.4

FTSE 250 fair value proportions

Year	Basic Materials	Consumer Goods	Consumer Services	Healthcare	Industrials	Oil & Gas	Technology	Telecom	Utilities
2005	3.51	4.13	57.0	0.07	30.2	0.61	1.72	2.08	0.68
2006	13.9	10.2	44.0	0.75	24.6	2.06	0.87	2.28	1.36
2007	4.56	5.23	62.0	0.68	20.3	3.56	1.06	1.09	1.51
2008	4.57	4.62	50.9	0.49	31.1	1.86	1.62	4.46	0.40
2009	19.5	6.83	43.8	0.72	19.1	4.12	1.25	4.19	0.54
2010	3.03	8.45	46.2	0.96	29.5	4.40	1.14	5.50	0.91
2011	2.96	5.59	45.7	0.46	30.8	6.52	0.36	5.32	2.29
2012	1.45	7.11	48.9	0.49	28.9	3.69	0.45	5.94	3.01

Table AP 3.5 shows distribution of derivatives fair value proportions across nine different industries from 2005 to 2012. It shows that though the number of FTSE 100 firms in the oil and gas industry was small, most derivatives fair values were in this industry. In 2005, this figure was as high as 76.8%. However, the percentage of fair values in oil and gas industry shows a noticeable decline during the study; by the end of 2012 this was only 39.1%, although this was still higher than the percentage of firms using derivatives in other industries. Among FTSE 250 firms the majority of derivatives fair values were in the consumer services industry followed by industrial firms. As the largest number of FTSE 250 firms were listed under these two categories, these results are not surprising.

In FTSE 100 firms, the lowest proportion of derivative fair values was in the technology category. In 2007, this was only 0.001%. By 2012 the proportion increased slightly up to 0.131%. Again, one of the reasons for this low usage could be down to the very small number of firms listed in the technology category. Furthermore compared to industries such as oil and gas firms listed in technology category relatively face lesser market related risks. In FTSE 250 firms, from 2005 to 2007 the healthcare sector had the lowest percentage of derivatives fair values while from 2008 to 2010 it was utility firms. Finally, in 2011 and 2012, firms listed in the technology category reported the least amount of derivatives fair values in their balance sheets. Regardless of the sector derivative fair values percentages did not even reach 1% (the lowest was 0.07% in 2005 in healthcare and the highest 0.91% in 2010 in utilities). Over time there was a noticeable upward trend in the percentages of derivative users in the FTSE 100 basic materials, consumer goods, consumer services, telecommunications and utilities categories. The next section examines how the firms in different industries used hedge accounting and different instruments.

However, one of the main practical issues that arose when conducting the industry analysis is the lack of comparability of other study results with the current study; that was mainly for two reasons (i) lack of available studies (ii) classification of firms to an industry varied between studies. Therefore, while acknowledging the difficulty of accessing the derivatives usage data previous studies faced this study does not intend to carry out a direct comparison between studies and the industries as this will confuse the true nature of derivatives use amongst industries.

AP 3.5 Basic Materials

AP 3.5.1 Number of users and their respective fair values in absolute terms – Basic Materials

Table AP 3.6
Distribution of derivatives instruments - basic materials

FTSE 100

Year	No of Derivatives users (£m)	No of interest rate swap users (£m)	No of cross currency swap users (£m)	No of forwards users (£m)	No of commodity derivatives users (£m)	No of other derivatives users(£m)
2005	9 (2,547.6)	7 (144.0)	3 (248.0)	6 (271.1)	6 (1,533.4)	5 (350.1)
2006	9 (2,514.6)	7 (388.2)	4 (394.5)	8 (270.8)	6 (1,241.1)	5 (220.1)
2007	10 (3,690.4)	7 (192.4)	5 (605.0)	7 (494.6)	7 (1,921.0)	4 (477.4)
2008	10 (6,788.0)	6 (714.9)	5 (981.0)	9 (1,418.7)	7 (3,090.7)	5 (582.6)
2009	10 (4,502.4)	6 (841.7)	5 (590.1)	8 (839.5)	8 (1,732.4)	5 (498.5)
2010	9 (4,396.9)	5 (1,180.1)	4 (701.9)	8 (1,118.4)	6 (1,089.4)	4 (307.1)
2011	10 (4,974.6)	7 (1,917.7)	5 (1,024.1)	9 (926.6)	7 (840.1)	6 (266.1)
2012	10 (4,656.9)	7 (2,114.8)	5 (867.0)	9 (715.8)	6 (627.9)	6 (329.6)

FTSE 250

Year	No of derivatives users (£m)	No of interest rate swap users (£m)	No of cross currency swap users (£m)	No of forwards users (£m)	No of commodity derivatives users (£m)	No of other derivatives users (£m)
2005	4 (31.5)	1 (0.09)	0 (0.00)	2 (3.15)	0 (0.00)	2 (28.3)
2006	5 (163.5)	1 (1.35)	0 (0.00)	4 (15.6)	0 (0.00)	2 (146.6)
2007	7 (101.1)	2 (11.9)	0 (0.00)	4 (65.2)	1 (3.93)	3 (20.1)
2008	9 (234.9)	4 (35.7)	0 (0.00)	6 (130.1)	2 (29.6)	4 (39.4)
2009	8 (763.4)	4 (52.3)	0 (0.00)	6 (35.2)	1 (2.67)	4 (673.2)
2010	10 (95.0)	5 (47.1)	0 (0.00)	7 (30.4)	1 (2.34)	4 (15.2)
2011	10 (103.4)	5 (33.1)	0 (0.00)	8 (58.9)	1 (2.36)	3 (9.05)
2012	9 (45.6)	4 (23.6)	0 (0.00)	6 (16.9)	1 (0.54)	4 (4.62)

Tables AP 3.6 summarises the distribution of different derivatives instruments in the 'basic materials' industry. It shows that in large firms from 2006 to 2012, forward currency contracts were the most popular instrument type; in 2005 interest rate swaps exceeded the forwards. However, when fair values are considered, it is clear that until 2010 commodity contracts fair values exceeded all other instrument types; from 2010 onwards, the use of interest rate swaps fair values began to escalate. The time trends in the basic materials sector were quite similar to the general trend in FTSE 350 firms; total derivative contracts and commodity contract fair values peaked in 2008 and then followed a steady downward trend. In FTSE 250 firms, none used cross currency swaps throughout the study period. In addition, usage of commodity contracts appeared to be minimal. Commodity contracts and interest rate swaps were the most frequently used derivatives in FTSE 100 basic materials firms. However, except for 'other derivatives', fair values of these instruments were rather low, ranging from £0.09M to £130.1m. 'Other derivatives' fair values showed an unusual spike in 2009, when it reached closer to £675m. Furthermore, unlike in FTSE 100 firms, FTSE 250 commodity fair values were significantly smaller compared with interest rate, forwards and 'other derivatives'. Berkman *et al*. (2002) reported that in their sample 61.5% of mining firms used derivatives by the end of 1995. In addition, their study showed that 38.5% of the mining firms used forwards, while 36.5% used commodity contracts and 15.4% used interest rate derivatives. Grant and Marshall (1997) reported that in the UK commodity derivatives use was concentrated to few industries, especially in the mining industry. Heaney and Winata (2005) reported that in Australia derivatives usage was 82.99% for the gold mining/explorer/producer industry for the financial year ended 1999.

Using a sample of 97 firms of the top 200 resource firms in Australia, Yip and Nguyen (2012) provided the use of forward currency derivatives figures for 2006 to 2009. They reported that of the 97 Australian resources firms in their sample, 25, 32, 32 and 28 firms used forwards for year 2006, 2007 2008 and 2009 respectively. This is a clear indication that during the financial crisis Australian resources firms were particularly interested in managing exchange rate risk. In addition, Birt *et al*. (2013) examined the derivatives use in the Australian extraction sector and found that 23%of the firms in their sample used derivatives. Further, they found that commodity risk and foreign exchange risk management were the most common purposes for using derivatives; forward rate agreements were the most widely used instrument.

AP 3.5.2 Hedge accounting use – Basic Materials category

Table AP 3.7
FTSE 100 and FTSE 250 hedge accounting use - basic materials

FTSE 100

Year	No of fair value hedge users (£m)	Proportion of fair value hedge users (%)	No of cash flow hedge users (£m)	Proportion of cash flow hedge users (%)	No of net investment hedge users (£m)	Proportion of net investment hedge users (%)	Total No of hedge accounting users (£m)	Proportion of hedge accounting users	No of FVTPL users (£m)	Proportion of FVTPL users
2005	5 (258.7)	62.5	8 (876.1)	100.0	1 (0.8)	12.5	8 (1,135.6)	88.9	6 (1,410.9)	66.7
2006	6 (633.1)	66.7	9 (675.7)	100.0	1 (0.5)	11.1	9 (1,309.3)	100.0	7 (1,205.3)	77.8
2007	6 (571.9)	66.7	9 (1,202.6)	100.0	1 (2.8)	11.1	9 (1,777.2)	90.0	7 (1,913.2)	70.0
2008	6 (1,302.2)	60.0	10 (1,350.6)	100.0	1 (1.2)	10.0	10 (2,654.0)	100.0	8 (4,133.9)	80.0
2009	6 (1,077.1)	66.7	9 (866.1)	100.0	1 (2.0)	11.1	9 (1,945.2)	90.0	9 (2,557.1)	90.0
2010	6 (1,583.3)	85.7	6 (761.2)	85.7	1 (1.7)	14.3	7 (2,346.2)	77.8	9 (2,050.7)	100.0
2011	7 (2,140.5)	77.8	8 (855.5)	88.9	1 (0.3)	11.1	9 (2,996.3)	90.0	9 (1,978.3)	90.0
2012	7 (2,128.8)	87.5	8 (725.0)	100.0	0 (0.0)	0.00	8 (2,853.9)	80.0	10 (1,801.2)	100.0

FTSE 250

Year	No of fair value hedge users (£m)	Proportion of fair value hedge users (%)	No of cash flow hedge users (£m)	Proportion of cash flow hedge users (%)	No of net investment hedge users (£m)	Proportion of net investment hedge users (%)	Total No of hedge accounting users (£m)	Proportion of hedge accounting users	No of FVTPL users (£m)	Proportion of FVTPL users
2005	0 (0.00)	0.00	2 (3.15)	100.0	0 (0.00)	0.00	2 (3.15)	50.0	2 (28.4)	50.0
2006	0 (0.00)	0.00	4 (13.2)	100.0	0 (0.00)	0.00	4 (13.2)	80.0	4 (150.3)	80.0
2007	0 (0.00)	0.00	4 (16.1)	100.0	0 (0.00)	0.00	4 (16.1)	57.1	4 (85.0)	57.1
2008	0 (0.00)	0.00	6 (115.8)	100.0	0 (0.00)	0.00	6(115.8)	66.7	5 (119.1)	55.6
2009	0 (0.00)	0.00	6 (47.1)	100.0	1 (0.37)	16.7	6 (47.5)	75.0	6 (715.9)	75.0
2010	1 (2.40)	14.3	7 (37.1)	100.0	1 (1.02)	14.3	7 (40.5)	70.0	7 (54.5)	70.0
2011	2 (6.34)	22.2	8 (43.3)	88.9	1 (0.45)	11.1	9 (50.1)	90.0	4 (53.3)	40.0
2012	1 (0.40)	12.5	8 (21.7)	100.0	1 (0.98)	12.5	8 (23.1)	88.9	5 (22.5)	55.6

Table AP 3.7 shows the proportion of firms using hedge accounting in the basic materials category, their fair values by three hedging categories and finally FVTPL. The data shows that in FTSE 100 basic materials firms the percentage using FVTPL increased during the study period, reaching 100% by 2012; still, a majority of firms used hedge accounting. The data also revealed that cash flow hedge is the most frequently used hedging category while fair values hedges and net investment hedges followed. Like large firms, almost all hedge accounting users in FTSE 250 used cash flow hedges[60].

[60] From 2005 to 2010 and then again in 2012 every hedge accounting user used cash flow hedging.

AP 3.6 Consumer Goods

AP 3.6.1 Number of users and fair values

Table AP 3.8
Distribution of derivatives instruments - Consumer goods

FTSE 100						
Year	**No of derivatives users (£m)**	**No of interest rate swap users (£m)**	**No of cross currency swap users (£m)**	**No of forwards users (£m)**	**No of commodity derivatives users (£m)**	**No of other derivatives users (£m)**
2005	9 (1,894.1)	5 (382.9)	5 (449.4)	8 (565.6)	2 (467.0)	5 (29.1)
2006	9 (1,524.2)	5 (200.2)	6 (343.6)	8 (695.2)	2 (233.0)	4 (52.3)
2007	9 (2,592.5)	6 (250.5)	5 (781.0)	8 (904.9)	5 (581.1)	4 (74.9)
2008	9 (4,882.0)	7 (733.5)	5 (1,262.4)	9 (2,442.1)	5 (482.8)	5 (38.7)
2009	9 (3,790.1)	6 (1,357.9)	5 (1,555.8)	9 (951.8)	4 (266.5)	5 (341.9)
2010	9 (3,815.2)	5 (1,679.2)	5 (933.8)	9 (1,150.5)	4 (300.5)	4 (248.8)
2011	9 (3,763.1)	5 (1,929.0)	5 (977.9)	9 (843.3)	5 (141.4)	5 (128.5)
2012	9 (3,874.5)	5 (2,456.0)	5 (544.9)	9 (702.0)	4 (183.2)	5 (11.6)

FTSE 250						
Year	**FTSE 250 No of derivatives users (£m)**	**No of interest rate swap users (£m)**	**No of cross currency swap users (£m)**	**No of forwards users (£m)**	**No of commodity derivatives users (£m)**	**No of other derivatives users (£m)**
2005	9 (37.1)	7 (14.2)	2 (21.2)	5 (1.66)	0 (0.00)	0 (0.00)
2006	9 (119.3)	6 (7.47)	2 (109.4)	5 (2.48)	0 (0.00)	0 (0.00)
2007	10 (116.1)	5 (35.6)	3 (75.3)	6 (5.20)	0 (0.00)	0 (0.00)
2008	12 (237.8)	7 (38.0)	3 (178.5)	7 (13.0)	0 (0.00)	3 (8.36)
2009	13 (267.8)	8 (121.1)	3 (107.6)	7 (5.45)	0 (0.00)	3 (33.7)
2010	13 (265.3)	8 (91.3)	3 (129.8)	8 (8.40)	0 (0.00)	4 (35.9)
2011	11 (195.7)	4 (39.2)	2 (119.1)	8 (8.62)	0 (0.00)	3 (28.8)
2012	10 (224.1)	3 (56.4)	2 (125.7)	8 (9.94)	0 (0.00)	3 (32.0)

Table AP 3.8 shows that the number of firms using derivatives remained constant in FTSE 100 consumer goods firms throughout the study period. In addition, there were no noteworthy changes or patterns by different instrument categories. Forwards appeared to be the most widely instrument type; from 2008 to 2012; all FTSE 100 derivatives user in the consumer goods category used forwards. Further, interest rate fair values rose throughout the study period. Also, there was a noticeable spike in cross currency and forwards contracts fair values in 2008.

However, Table AP 3.8 shows that the number of FTSE 250 derivatives users increased from 2005 to 2010 and then decreased. Having been the most popular instrument until 2010, there was a significant drop in interest rate swap users from 2011 onwards, resulting in the drop in overall derivative users. None of the smaller firms in this category reported commodity derivatives during the study period. However, popularity of forward currency contracts seemed to escalate as there was an increase in users.

As explained in section 4.8.1 direct comparison of above results with other studies might produce misleading conclusions it's vital to revisit these results as it will add value to the current study and help to future researcher. Using a sample of 590 firms listed in Nordic OMX Stock Exchanges at the end of 2007, Brunzell, Hansson and Liljeblom (2011) examined derivatives use practices in Denmark, Finland, Iceland and Sweden. Their survey results showed that 41% of the firms in their consumer category used derivatives. However, in their research design they have also included healthcare firms as consumer firms.

AP 3.6.2 Hedge accounting use – Consumer Goods category

Hedge accounting usage data in the consumer goods industry shows that in this category cash flow hedging was the most frequently used in both FTSE 100 and FTSE 250 firms. Fair value hedge and net investment hedge use appeared to be very limited in FTSE 250 firms. In FTSE 100 firms, fair value hedges were used moderately (57.1%) before the financial crisis, declining to 37.5% at the start of the financial crisis in 2007). However, after the crisis fair value hedge use increased again, reaching pre-crisis levels (over 57%). Unlike in most other industries, FTSE 100 consumer goods firms used net investment hedges to moderate levels ranging from 55.5% to 71.4%; again, similar to FTSE 100 fair value hedges, the proportion of users decreased ahead of the financial crisis.

Table AP 3.9

FTSE 100 and FTSE 250 hedge accounting use - consumer goods

FTSE 100

Year	No of fair value hedge users (£m)	Proportion of fair value hedge users (%)	No of cash flow hedge users (£m)	Proportion of cash flow hedge users (%)	No of net investment hedge users (£m)	Proportion of net investment hedge users (%)	Total No of hedge accounting users (£m)	Proportion of hedge accounting users	No of FVTPL users (£m)	Proportion of FVTPL users
2005	4 (185.1)	57.2	5 (128.8)	71.4	5 (258.8)	71.4	7 (572.7)	77.8	8 (1,321.3)	88.9
2006	4 (131.3)	57.2	6 (69.6)	85.7	5 (404.9)	71.4	7 (605.7)	77.8	9 (918.5)	100.0
2007	3 (222.4)	37.5	8 (216.0)	100.0	5 (626.8)	62.5	8 (1,065.2)	88.9	8 (1,527.3)	88.9
2008	4 (623.6)	44.4	8 (709.0)	88.9	5 (990.7)	55.6	9 (2,323.3)	100.0	9 (2,558.7)	100.0
2009	4 (465.9)	44.4	8 (231.4)	88.9	5 (378.2)	55.6	9 (1,075.5)	100.0	9 (2,714.6)	100.0
2010	4 (499.3)	44.4	8 (410.2)	88.9	5 (387.6)	55.6	9 (1,297.1)	100.0	8 (2,518.1)	88.9
2011	4 (730.5)	50.0	7 (350.7)	87.5	5 (200.4)	62.5	8 (1,281.5)	88.9	8 (2,481.6)	88.9
2012	4 (715.9)	57.1	7 (484.7)	100.0	4 (177.6)	57.1	7 (1,378.2)	77.8	8 (2,496.3)	88.9

FTSE 250

Year	No of fair value hedge users (£m)	Proportion of fair value hedge users (%)	No of cash flow hedge users (£m)	Proportion of cash flow hedge users (%)	No of net investment hedge users (£m)	Proportion of net investment hedge users (%)	Total No of hedge accounting users (£m)	Proportion of hedge accounting users	No of FVTPL users (£m)	Proportion of FVTPL users
2005	0 (0.00)	0.00	8 (24.3)	100.0	1 (0.07)	12.5	8 (24.4)	88.9	3 (12.7)	33.3
2006	0 (0.00)	0.00	8 (112.8)	100.0	0 (0.00)	0.00	8 (112.8)	88.9	3 (6.59)	33.3
2007	1 (17.7)	10.00	9 (94.4)	90.0	0 (0.00)	0.00	10 (112.1)	100.0	2 (4.01)	20.0
2008	1 (2.10)	9.09	10 (218.7)	90.9	0 (0.00)	0.00	11 (220.8)	91.7	5 (17.0)	41.7
2009	1 (11.1)	9.09	10 (242.3)	90.9	0 (0.00)	0.00	11 (253.4)	84.6	6 (14.4)	46.2
2010	1 (24.0)	11.1	9 (218.2)	100.0	1 (1.60)	11.1	9 (243.8)	69.2	8 (21.5)	61.5
2011	1 (30.8)	14.3	7 (154.8)	100.0	1 (1.70)	14.3	7 (187.3)	63.6	7 (8.44)	63.6
2012	1 (28.7)	12.5	8 (174.4)	100.0	1 (13.5)	12.5	8 (216.6)	80.0	5 (7.50)	50.0

In 2005, the overall hedge accounting user percentage in large firms was 77.7%. However, by 2008 this increased to 100%, and throughout the latter part of the financial crisis every FTSE 100 firm in the consumer goods category used hedge accounting until 2010; this was followed by a declining trend in 2011 and 2012. In FTSE 250 firms 88.9% of consumer goods used hedge accounting in 2005 which reached 100% in 2007. There was then a gradual decline in hedge accounting users until 2011, before rising again in 2012 to 80%. Despite larger proportions of FTSE 100 firms using hedge accounting, derivatives accounted as FVTPL remained high; fluctuating between 88.9% and 100%. On the other hand, proportions of FVTPL users showed a different pattern in small firms. In 2005 and 2006, one third of smaller consumer good firms used FVTPL. This further reduced to 20% in 2007. There was then a clear upward trend until 2011 to 63.6%, before reversing in 2012 when half of the firms used FVTPL for derivatives accounting.

Even though the exact proportion of hedge accounting use was not mentioned, Brunzell *et al.* (2011) examined the motivations behind hedging versus profit-seeking use of derivatives amongst Nordic firms. They found that over half of the derivative users amongst their 590 firms gave some weight to additional income as a motive for using derivatives. Further they constructed a scale from one to five (1 being less important and 5 being very important) to assess the extent of derivatives used for hedging and to what extent they were used for additional income generation purposes. They reported 4.6 points for hedge accounting use and 1.5 for additional income; therefore, as far as hedge accounting and FVTPL derivatives are concerned, this indicates that amongst Nordic consumer goods & services and healthcare firms, the majority of these derivatives were reported under hedge accounting while a minority reported as FVTPL.

AP 3.7 Consumer Services

AP 3.7.1 Number of users and their respective absolute fair values

Table AP 3.10 shows the number of derivatives users by different instrument types and their respective fair values in the FTSE 100 and FTSE 250 consumer services category. It shows that interest rate swaps and forwards were frequently used by both large and small firms. Further, in 2005 to 2012, approximately half of the FTSE 100 consumer services firms used cross currency swaps while only a small number of FTSE 250 firms used cross currency swaps. The number of FTSE 100 consumer services firms using ‘other derivatives’ increased during the study period. In FTSE 250 firms, however, this figure remained unchanged. In addition, a small number of FTSE 100 consumer services firms used commodity derivatives. None of the small consumer services firms used commodity derivatives during the study period.

Table AP 3.10
Distribution of derivatives instruments - consumer services

FTSE 100

Year	No of derivatives users (£m)	No of interest rate swap users (£m)	No of cross currency swap users (£m)	No of forwards users (£m)	No of commodity derivatives users (£m)	No of other derivatives users (£m)
2005	14 (1,616.8)	14 (479.0)	9 (499.8)	6 (294.0)	0 (0.00)	4 (344.0)
2006	16 (1,838.8)	13 (451.2)	8 (681.2)	9 (285.7)	1 (6.80)	4 (413.9)
2007	17 (2,579.8)	13 (423.2)	8 (877.7)	13 (888.9)	1 (13.1)	6 (376.7)
2008	17 (6,189.0)	14 (1,344.2)	7 (2,296.5)	13 (1,837.2)	3 (198.2)	7 (512.9)
2009	17 (5,287.2)	14 (970.7)	8 (2,237.2)	14 (1,178.0)	3 (158.1)	9 (743.3)
2010	18 (4,824.6)	14 (1,121.7)	8 (1,646.2)	12 (746.8)	2 (60.0)	10 (1,250.0)
2011	18 (5,622.6)	13 (1,347.2)	9 (1,702.6)	14 (701.7)	3 (117.6)	9 (1,753.4)
2012	18 (5,720.0)	13 (1,361.1)	9 (1,802.9)	15 (708.3)	3 (91.5)	10 (1,760.3)

FTSE 250

Year	No of derivatives users (£m)	No of Interest rate swap users (£m)	No of cross currency swap users (£m)	No of forwards users (£m)	No of commodity derivatives users (£m)	No of other derivatives users (£m)
2005	24 (511.8)	17 (273.2)	4 (77.1)	11 (89.4)	0 (0.00)	9 (72.2)
2006	29 (516.2)	22 (199.1)	5 (75.6)	14 (176.5)	0 (0.00)	9 (65.0)
2007	29 (1,375.4)	20 (400.6)	6 (106.9)	17 (433.0)	0 (0.00)	10 (434.9)
2008	30 (2,618.6)	20 (600.9)	5 (434.9)	17 (893.1)	0 (0.00)	10 (689.6)
2009	31 (1,716.3)	21 (710.0)	4 (206.1)	15 (256.0)	0 (0.00)	10 (544.2)
2010	29 (1,450.8)	20 (678.1)	4 (200.0)	17 (354.9)	0 (0.00)	10 (217.8)
2011	28 (1,598.5)	19 (868.7)	4 (200.5)	14 (273.9)	0 (0.00)	10(255.3)
2012	25 (1,541.4)	16 (1,021.3)	4 (184.5)	14 (240.5)	0 (0.00)	10 (95.1)

Bodnar *et al*. (1995) reported that derivatives were least used in service industries. In their sample the proportion of firms using derivatives varied from 14% in other services to 29% in wholesale. However, in this research, throughout the study period all FTSE 100 firms and over 66.7% of FTSE 250 firms used derivatives. Berkman *et al*. (1997) found that in New Zealand 86% of retail and wholesale firms used derivatives, indicating similar derivatives user patterns to the UK.

AP 3.7.2 Hedge accounting use – Consumer Services

Table AP 3.11
FTSE 100 and FTSE 250 hedge accounting use - consumer services

FTSE 100

Year	No of fair value hedge users (£m)	Proportion of fair value hedge users (%)	No of cash flow hedge users (£m)	Proportion of cash flow hedge users (%)	No of net investment hedge users (£m)	Proportion of net investment hedge users (%)	Total No of hedge accounting users (£m)	Proportion of hedge accounting users	No of FVTPL users (£m)	Proportion of FVTPL users
2005	10 (539.2)	71.4	11 (319.4)	78.6	6 (270.7)	42.9	14 (1,129.3)	100.0	11 (487.5)	78.6
2006	9 (521.4)	60.0	10 (484.5)	66.7	6 (546.7)	40.0	15 (1,552.7)	93.8	13 (286.1)	81.3
2007	10 (737.1)	58.8	13 (687.2)	76.5	6 (578.9)	35.3	17 (2,003.2)	100.0	14 (576.6)	82.4
2008	10 (2,034.6)	58.8	14 (2,284.5)	82.4	5 (605.0)	29.4	17 (4,924.1)	100.0	14 (1,264.9)	82.4
2009	9 (1,772.9)	56.3	13 (1,758.4)	81.3	6 (575.5)	37.5	16 (4,106.8)	94.1	13 (1,180.4)	76.5
2010	10 (1,494.0)	58.8	14 (1,318.8)	82.4	7 (447.0)	41.2	17 (3,259.8)	94.4	13 (1,564.8)	72.2
2011	10 (1,755.4)	58.8	13 (1,548.2)	76.5	6 (254.4)	35.3	17 (3,557.9)	94.4	14 (2,064.6)	77.8
2012	11 (1,888.5)	64.7	13 (1,567.2)	76.5	7 (250.2)	41.2	17 (3,705.9)	94.4	14 (2,018.1)	77.8

FTSE 250

Year	No of fair value hedge users (£m)	Proportion of fair value hedge users (%)	No of cash flow hedge users (£m)	Proportion of cash flow hedge users (%)	No of net investment hedge users (£m)	Proportion of net investment hedge users (%)	Total No of hedge accounting users (£m)	Proportion of hedge accounting users	No of FVTPL users (£m)	Proportion of FVTPL users
2005	5 (80.1)	27.8	16 (280.6)	88.9	5 (35.7)	27.8	18 (396.4)	75.0	12 (115.4)	50.0
2006	7 (30.3)	33.3	21 (323.6)	100.0	4 (58.9)	19.1	21 (412.8)	72.4	14 (103.4)	48.3
2007	6 (33.6)	24.0	25 (706.3)	100.0	6 (156.8)	24.0	25 (896.7)	86.2	15 (478.7)	51.7
2008	6 (254.6)	22.2	27 (1,823.7)	100.0	8 (311.6)	29.6	27 (2,389.9)	90.0	16 (228.7)	53.3
2009	8 (152.8)	32.0	25 (1,255.0)	100.0	5 (207.9)	20.0	25 (1,615.7)	80.7	17 (100.6)	54.8
2010	7 (182.1)	26.9	25 (983.8)	96.2	5 (194.3)	19.2	26 (1,360.2)	89.7	13 (90.6)	44.8
2011	5 (209.2)	20.8	23 (1,120.6)	95.8	4 (148.8)	16.7	24 (1,478.6)	85.7	13 (119.8)	46.4
2012	6 (229.9)	27.3	21 (1,145.3)	95.5	3 (72.5)	13.6	22 (1,447.7)	88.0	13 (93.7)	52.0

Table AP 3.11 shows that hedge accounting use was widespread in the consumer services industry. In FTSE 100 firms during the study period the percentage of hedge accounting users was around 93.7%, whereas in FTSE 250 firms it fluctuated between 72.4% and 90%. In addition, approximately three quarters of FTSE 100 consumer services firms reported FVTPL derivatives in their annual reports, although only one in two small firms used FVTPL in their balance sheets. In FTSE 100 consumer services firms, cash flow hedges were the most frequently used hedging category, followed by fair value hedges and net investment hedges. In FTSE 250 firms, cash flow hedges were the most frequently used hedging category. However, with the exception of 2008, fair value and net investment hedges were used in equal proportion throughout the study period.

AP 3.8 Healthcare

AP 3.8.1 Number of users and their respective absolute fair values

Table AP 3.12
Distribution of derivatives instruments - healthcare

FTSE 100						
Year	**No of derivatives users (£m)**	**No of interest rate swap users (£m)**	**No of cross currency swap users (£m)**	**No of forwards users (£m)**	**No of commodity derivatives users (£m)**	**No of other derivatives users (£m)**
2005	4 (443.0)	2 (80.5)	2 (75.1)	4 (198.4)	0 (0.00)	1 (89.0)
2006	4 (342.6)	2 (70.8)	2 (151.0)	4 (79.8)	0 (0.00)	1 (41.0)
2007	4 (837.9)	3 (72.8)	2 (169.0)	4 (578.2)	0 (0.00)	1 (18.0)
2008	4 (2,241.9)	3 (429.0)	2 (39.8)	4 (1,750.0)	0 (0.00)	1 (23.0)
2009	4 (628.6)	3 (234.0)	0 (0.00)	4 (385.6)	0 (0.00)	1 (9.00)
2010	4 (640.7)	2 (303.9)	0 (0.00)	4 (321.7)	0 (0.00)	1 (15.0)
2011	4 (597.6)	2 (316.9)	0 (0.00)	4 (271.7)	0 (0.00)	1 (9.00)
2012	4 (445.6)	2 (246.5)	2 (48.0)	4 (142.1)	0 (0.00)	1 (9.00)

FTSE 250						
Year	**No of derivatives users (£m)**	**No of interest rate swap users (£m)**	**No of cross currency swap users (£m)**	**No of forwards users (£m)**	**No of commodity derivatives users (£m)**	**No of other derivatives users (£m)**
2005	3 (0.60)	1 (0.12)	0 (0.00)	2 (0.42)	0 (0.00)	1 (0.06)
2006	6 (8.77)	3 (1.35)	2 (7.32)	1 (0.10)	0 (0.00)	1 (0.00)
2007	6 (15.1)	3 (3.63)	2 (11.0)	3 (0.44)	0 (0.00)	1 (0.03)
2008	6 (25.1)	3 (6.65)	2 (9.49)	3 (7.62)	1 (0.20)	1 (1.14)
2009	6 (28.1)	4 (12.5)	2 (13.7)	1 (0.80)	0 (0.00)	1 (1.18)
2010	6 (30.0)	4 (8.14)	2 (19.2)	3 (2.08)	0 (0.00)	1 (0.57)
2011	7 (16.2)	6 (9.01)	1 (6.53)	2 (0.62)	0 (0.00)	0 (0.00)
2012	7 (15.5)	6 (7.91)	1 (5.07)	2 (2.20)	1 (0.30)	0 (0.00)

From 2005 to 2012 only four FTSE 100 healthcare firms used derivatives fair values in their balance sheets; all these used forwards contracts (Table AP 3.12). Furthermore, interest rate swaps were used by several firms. In small firms, during the study period the use of interest rate swaps increased. This suggests that small firms were particularly interested in managing Interest rate risk. Additionally, none of the firms in FTSE 100 healthcare sector used commodity derivatives, yet one small firm used commodity derivatives in 2008 and 2012. A similar study by Nguyen & Faff

(2002) showed that 59.2% of the Australian Healthcare and Biological Index firms used derivatives in 1999 and 2000. However, comparison of these figures with the current study should be made with caution for several reasons. Firstly, Nguyen & Faff (2002) data included healthcare as well as biological firms in their analysis whereas the current study has only included healthcare firms; secondly their study used notional value as the identifier of derivative users while the current study has used fair values. Further, their study used pre-IFRS data while this study used IFRS data. Finally, the current study had an average of six to seven healthcare firms per year (however with a much larger firm size), whereas Nguyen & Faff (2002) had 13-14 firms per year; all of these reasons could have influenced the different proportions.

AP 3.8.2 Hedge accounting use – Healthcare

Table AP 3.13

FTSE 100 and FTSE 250 hedge accounting use - healthcare

FTSE 100

Year	No of fair value hedge users (£m)	Proportion of fair value hedge users (%)	No of cash flow hedge users (£m)	Proportion of cash flow hedge users (%)	No of net investment hedge users (£m)	Proportion of net investment hedge users (%)	Total No of hedge accounting users (£m)	Proportion of hedge accounting users	No of FVTPL users (£m)	Proportion of FVTPL users
2005	2 (147.5)	66.7	2 (14.1)	66.7	2 (119.1)	66.7	3 (280.7)	75.0	3 (162.3)	75.0
2006	2 (70.8)	66.7	2 (50.6)	66.7	2 (118.0)	66.7	3 (239.5)	75.0	3 (103.2)	75.0
2007	2 (37.6)	66.7	2 (68.1)	66.7	2 (332.0)	66.7	3 (437.7)	75.0	3 (400.3)	75.0
2008	2 (266.3)	66.7	2 (96.8)	66.7	2 (607.8)	66.7	3 (970.9)	75.0	3 (1,271.0)	75.0
2009	2 (151.6)	66.7	1 (26.6)	33.3	1 (91.0)	33.3	3 (269.3)	75.0	3 (359.3)	75.0
2010	2 (201.8)	66.7	1 (35.8)	33.3	1 (23.0)	33.3	3 (260.5)	75.0	3 (380.1)	75.0
2011	2 (195.3)	66.7	1 (21.2)	33.3	1 (23.0)	33.3	3 (239.6)	75.0	3 (358.1)	75.0
2012	2 (146.9)	66.7	2 (14.5)	66.7	3 (81.0)	100.0	3 (242.4)	75.00	3 (203.2)	75.0

FTSE 250

Year	No of fair value hedge users (£m)	Proportion of fair value hedge users (%)	No of cash flow hedge users (£m)	Proportion of cash flow hedge users (%)	No of net investment hedge users (£m)	Proportion of net investment hedge users (%)	Total No of hedge accounting users (£m)	Proportion of hedge accounting users	No of FVTPL users (£m)	Proportion of FVTPL users
2005	0 (0.00)	0.00	3 (0.51)	100.0	0 (0.00)	0.00	3 (0.51)	100.0	2 (0.09)	66.6
2006	1 (3.22)	25.0	4 (3.65)	100.0	1 (1.80)	25.0	4 (8.67)	66.7	2 (0.10)	33.3
2007	1 (5.80)	25.0	4 (7.73)	100.0	1 (1.10)	25.0	4 (14.6)	66.7	2 (0.43)	33.3
2008	1 (5.45)	20.0	5 (11.6)	100.0	1 (0.10)	20.0	5 (17.1)	83.3	2 (7.99)	33.3
2009	1 (4.75)	20.0	5 (15.9)	100.0	1 (5.70)	20.0	5 (26.3)	83.3	3 (1.77)	50.0
2010	1 (2.17)	20.0	5 (14.8)	100.0	1 (9.60)	20.0	5 (26.6)	83.3	3 (3.45)	50.0
2011	1 (4.80)	20.0	5 (10.1)	100.0	0 (0.00)	0.00	5 (14.9)	71.4	2 (1.28)	28.6
2012	1 (7.30)	20.0	5 (5.14)	100.0	0 (0.00)	0.00	5 (12.5)	71.4	3 (3.04)	42.9

Out of the four firms using derivatives in the FTSE 100 healthcare industry, three used hedge accounting. At the same time three of the FTSE 100 healthcare firms used FVTPL, as some of their derivatives fair values did not come under any of the three hedging categories. Further, two firms used fair values hedges throughout the study period. In 2005 to 2008, two FTSE 100 healthcare firms used cash flow hedges and net investment hedges. From 2009 onwards, only one firm used these categories until the end of financial year 2011.

All hedge accounting users in the FTSE 250 healthcare category used cash flow hedges. However, the use of fair value and net investment hedges was limited to only one firm. Further, like FTSE 250 consumer services firms, a much higher percentage of firms used hedge accounting compared to FVTPL.

AP 3.9 Industrials

AP 3.9.1 Number of users and their respective absolute fair values - Industrials

In both the FTSE 100 and FTSE 250 Indexes, a large number of firms in the industrial sector used derivatives. Among them, interest rate swaps and forwards were the most widely used. Further, cross currency swap usage increased in large firms. Previously Bodnar *et al*. (1995) reported that 40% of US manufacturing firms used derivatives in the mid 1990s. However, in this study the percentage was much higher. This could be because this study focused on all medium to large firms in the UK while Bodnar *et al*. (1995) used a selected number of small to large firms.

Using annual report disclosures, Berkman *et al*. (2002) compared the derivative use in industrial and mining firms in Australia in fiscal 1995. Their results showed that 52.8% of the Australian industrial firms used derivatives. Further they found that 38.6%, 27.4% and 8.5% firms used foreign currency, interest rate and commodity derivatives respectively. However, a study by Heaney and Winata (2005) found that all industrial firms in their sample used derivatives, a much higher percentage than Berkman *et al*. (2002) reported. A later study by Birt *et al*. (2013) suggested that the probable reasons for these changes were down to the determinants behind the derivatives usage during that particular time period. Further, Brunzell *et al*. (2011) reported that 68% of the industrial[61] firms used derivatives in 2007 amongst Nordic countries.

Table AP 3.14
Distribution of derivatives instruments - industrials

FTSE 100						
Year	**No of derivatives users (£m)**	**No of interest rate swap users (£m)**	**No of cross currency swap users (£m)**	**No of forwards users (£m)**	**No of commodity derivatives users (£m)**	**No of Other Derivatives users (£m)**
2005	16 (1,503.7)	12 (241.7)	7 (434.2)	13 (741.3)	2 (73.0)	5 (13.4)
2006	17 (1,617.5)	14 (174.2)	8 (534.9)	14 (824.9)	4 (77.6)	4 (6.00)
2007	17 (2,016.9)	14 (249.9)	9 (657.1)	15 (758.8)	3 (44.0)	3 (307.0)
2008	17 (7,567.3)	17 (1,094.6)	9 (1,920.2)	15 (3,855.1)	5 (324.5)	4 (372.8)
2009	17 (4,067.7)	17 (672.0)	11 (1,179.1)	12 (1,640.0)	4 (80.7)	4 (495.9)
2010	17 (4,211.4)	16 (613.3)	11 (1,212.6)	14 (1,551.5)	6 (92.1)	5 (741.8)
2011	16 (4,053.1)	15 (568.5)	10 (1,231.1)	14 (1,431.4)	5 (112.0)	2 (710.2)
2012	16 (2,942.9)	15 (560.3)	10 (876.39)	13 (1,230.7)	6 (56.0)	4 (219.5)

FTSE 250						
Year	**No of Derivatives users (£m)**	**No of Interest rate swap users (£m)**	**No of cross currency swap users (£m)**	**No of forwards users (£m)**	**No of commodity derivatives users (£m)**	**No of Other Derivatives users (£m)**
2005	31 (271.6)	19 (115.8)	9 (86.7)	22 (41.8)	2 (2.18)	5 (25.2)
2006	35 (289.2)	20 (96.7)	11 (124.2)	25 (59.2)	1 (0.30)	5 (8.81)
2007	37 (450.0)	21 (118.2)	11 (180.3)	27 (97.4)	1 (0.70)	6 (53.4)
2008	41 (1,597.3)	26 (363.6)	11 (533.1)	31 (573.5)	2 (3.90)	7 (123.2)
2009	40 (749.4)	28 (236.0)	10 (247.5)	30 (175.8)	3 (4.30)	8 (85.9)
2010	39 (926.0)	27 (376.0)	11 (330.0)	31 (159.4)	3 (6.90)	5 (53.7)
2011	42 (1,078.1)	23 (542.4)	12 (361.2)	32 (147.7)	4 (5.30)	8 (21.6)
2012	41 (912.1)	20 (500.0)	13 (300.5)	32 (97.4)	1 (0.10)	7 (14.2)

AP 3.9.2 Hedge accounting use – Industrials

Table AP 3.15 shows the distribution of FTSE 100 and FTSE 250 fair values by different hedging categories. It shows that from 2006 - 2011 all FTSE 100 firms used hedge accounting. Cash flow hedges were the most frequently used in both FTSE

[61] Their Industrial sample includes Industrial, IT and Telecom firms.

100 and FTSE 250 firms. Throughout the study period, the proportions of FVTPL users were around 70% in FTSE 100 firms. However, in FTSE 250 firms this figure was less than 56.1% suggesting that small firms were more concerned about applying hedge accounting for derivatives positions.

Table 3.15
FTSE 100 and FTSE 250 hedge accounting use - industrials

FTSE 100

Year	No of fair value hedge users (£m)	Proportion of fair value hedge users (%)	No of cash flow hedge users (£m)	Proportion of cash flow hedge users (%)	No of net investment hedge users (£m)	Proportion of net investment hedge users (%)	Total No of hedge accounting users (£m)	Proportion of hedge accounting users	No of FVTPL users (£m)	Proportion of FVTPL users
2005	7 (322.9)	46.7	11(282.7)	73.3	5 (60.6)	33.3	15 (666.2)	93.8	12 (837.5)	75.0
2006	8 (260.0)	47.1	13 (261.1)	76.5	4 (47.1)	23.5	17 (568.3)	100.0	12 (1,049.2)	70.6
2007	8 (459.8)	47.1	14 (259.3)	82.4	4 (57.8)	23.5	17 (776.9)	100.0	12 (1,239.9)	70.6
2008	10 (1,575.7)	58.8	14 (1,729.5)	82.4	5 (143.3)	29.4	17 (3,448.5)	100.0	12 (4,118.7)	70.6
2009	10 (1,069.4)	58.8	14 (645.4)	82.4	5 (116.3)	29.4	17 (1,831.1)	100.0	12 (2,236.6)	70.6
2010	10 (1,062.6)	58.8	13 (505.6)	76.5	5 (99.1)	29.4	17 (1,667.2)	100.0	13 (2,544.1)	76.5
2011	10 (1,113.1)	62.5	12 (486.5)	75.0	4 (51.8)	25.0	16 (1,651.4)	100.0	12 (2,401.7)	75.0
2012	9 (870.0)	60.0	12 (410.2)	80.0	4 (15.3)	26.7	15 (1,295.5)	93.8	12 (1,647.4)	75.0

FTSE 250

Year	No of fair value hedge users (£m)	Proportion of fair value hedge users (%)	No of cash flow hedge users (£m)	Proportion of cash flow hedge users (%)	No of net investment hedge users (£m)	Proportion of net investment hedge users (%)	Total No of hedge accounting users (£m)	Proportion of hedge accounting users	No of FVTPL users (£m)	Proportion of FVTPL users
2005	9 (40.9)	32.1	23 (114.3)	82.1	8 (75.3)	28.6	28 (230.6)	90.3	15 (41.0)	48.4
2006	9 (84.7)	29.0	26 (110.0)	83.9	12 (54.7)	38.7	31 (249.5)	88.6	17 (39.7)	48.6
2007	9 (62.0)	27.3	30 (187.9)	90.9	14 (87.3)	42.4	33 (337.2)	89.2	18 (112.7)	48.7
2008	9 (173.5)	24.3	37 (584.8)	100.0	12 (366.3)	32.4	37 (1,124.7)	90.2	23 (472.6)	56.1
2009	10 (101.4)	27.8	35 (282.5)	97.2	9 (142.6)	25.0	36 (526.5)	90.0	21 (222.9)	52.5
2010	12 (135.6)	32.4	37 (400.7)	100.0	9 (149.5)	24.3	37 (685.8)	94.9	18 (240.2)	46.2
2011	14 (163.6)	35.9	39 (526.7)	100.0	10 (129.6)	25.6	39 (819.9)	92.9	18 (258.2)	42.9
2012	13 (163.4)	33.3	38 (432.2)	97.4	10 (94.6)	25.6	39 (690.2)	95.1	15 (221.9)	36.6

AP 3.10 Oil & Gas

AP 3.10.1 Number of users and their respective absolute fair values – Oil & Gas

Table AP 3.16

Distribution of derivatives instruments – oil & gas

FTSE 100

Year	No of derivatives users (£m)	No of interest rate swap users (£m)	No of cross currency swap users (£m)	No of forwards users (£m)	No of commodity derivatives users (£m)	No of other derivatives users (£m)
2005	6 (51,779.5)	6 (167.9)	2 (315.7)	5 (181.8)	3 (47,819.9)	3 (3,294.29)
2006	6 (34,647.2)	5 (91.6)	3 (608.8)	6 (131.9)	3 (31,731.4)	4 (2,083.39)
2007	6 (31,385.4)	5 (113.9)	3 (1,142.4)	5 (631.8)	4 (27,455.4)	4 (2,041.96)
2008	6 (75,471.7)	4 (516.4)	3 (1,791.6)	5 (2,578.0)	4 (68,139.2)	4 (2,446.35)
2009	6 (34,933.3)	4 (386.4)	3 (2,020.0)	5 (848.9)	4 (29,917.5)	3 (1,760.47)
2010	6 (37,440.9)	4 (527.8)	3 (1,560.6)	5 (814.9)	4 (32,685.4)	3 (1,852.25)
2011	5 (32,726.8)	3 (844.9)	3 (1,818.7)	4 (1,018.5)	4 (27,339.7)	3 (1,705.17)
2012	5 (21,619.7)	3 (962.1)	3 (1,444.4)	3 (599.2)	3 (16,295.2)	4 (2,318.83)

FTSE 250

Year	No of derivatives users (£m)	No of interest rate swap users (£m)	No of cross currency swap users (£m)	No of forwards users (£m)	No of commodity derivatives users (£m)	No of other derivatives users (£m)
2005	2 (5.43)	1 (2.00)	0 (0.00)	1 (1.20)	2 (2.23)	0 (0.00)
2006	4 (24.12)	1 (2.10)	0 (0.00)	1 (0.90)	2 (1.26)	3 (19.9)
2007	5 (78.96)	1 (1.70)	0 (0.00)	1 (0.20)	3 (57.2)	3 (19.9)
2008	7 (95.82)	0 (0.00)	1 (0.10)	2 (19.6)	3 (55.6)	2 (20.5)
2009	5 (161.61)	2 (1.18)	0 (0.00)	3 (6.48)	4 (154.0)	0 (0.00)
2010	5 (138.08)	3 (11.6)	1 (1.79)	3 (11.3)	4 (111.3)	1 (2.11)
2011	7 (228.00)	3 (16.4)	2 (23.0)	5 (37.6)	5 (135.9)	2 (15.1)
2012	7 (116.31)	2 (14.1)	2 (28.3)	5 (18.7)	5 (43.6)	2 (11.6)

Table AP 3.16 shows that during the study period the proportion of FTSE 100 interest rate swap and forwards users declined while cross currency, commodity and 'other derivatives' users remained relatively constant. Further, as explained earlier, FTSE 100 commodity derivatives fair values showed an increase ahead of the 2007/2008 financial crisis, and then declined afterwards. Additionally, despite the small number of firms in the FTSE 100 commodity derivatives category, it represented the bulk of derivatives fair values in FTSE 350 firms. In FTSE 250 firms, derivatives use was relatively low until 2007, both in terms of proportions and fair values. Nevertheless, in the post-crisis period, the proportions increased in all instrument categories while fair values increased only in interest rate swaps, cross currency swaps, forwards and in 'other derivatives'. In FTSE 250 commodity derivatives, there was a nearly 300% upsurge of derivatives fair values in 2008 and 2009; though thereafter it declined. The data shows that in general large firms are heavy derivative users while small firms are light users. There are few previous studies reporting the derivative usage in the oil & gas industry. Heaney and Winata (2005) reported that 68% of oil & gas firms in Australia used derivatives.

AP 3.10.2 Hedge accounting use – Oil & Gas category

Table AP 3.17
FTSE 100 and FTSE 250 hedge accounting use – oil & gas

FTSE 100

Year	No of fair value hedge users (£m)	Proportion of fair value hedge users (%)	No of cash flow hedge users (£m)	Proportion of cash flow hedge users (%)	No of net investment hedge users (£m)	Proportion of net investment hedge users (%)	Total No of hedge accounting users (£m)	Proportion of hedge accounting users	No of FVTPL users (£m)	Proportion of FVTPL users
2005	3 (353.7)	50.0	6 (301.6)	100.0	1 (36.7)	16.7	6 (692.1)	100.0	5 (51,087.4)	83.3
2006	2 (212.5)	33.3	5 (185.0)	83.3	2 (62.9)	33.3	6 (460.4)	100.0	5 (34,186.7)	83.3
2007	2 (333.1)	33.3	5 (385.3)	83.3	2 (24.2)	33.3	6 (742.6)	100.0	5 (30,642.8)	83.3
2008	2 (1,071.8)	33.3	5 (1,435.8)	83.3	2 (41.7)	33.3	6 (2,549.3)	100.0	5 (72,922.3)	83.3
2009	2 (2,014.4)	33.3	6 (654.6)	100.0	1 (28.8)	16.7	6 (2,697.8)	100.0	5 (32,235.4)	83.3
2010	2 (1,731.5)	33.3	6 (701.7)	100.0	1 (35.2)	16.7	6 (2,468.4)	100.0	5 (34,972.5)	83.3
2011	2 (2,228.3)	40.0	5 (298.4)	100.0	1 (13.0)	20.0	5 (2,539.7)	100.0	4 (30,187.1)	80.0
2012	2 (2,356.2)	40.0	4 (946.0)	80.0	1 (3.00)	20.0	5 (3,305.2)	100.0	4 (18,314.5)	80.0

FTSE 250

Year	No of fair value hedge users (£m)	Proportion of fair value hedge users (%)	No of cash flow hedge users (£m)	Proportion of cash flow hedge users (%)	No of net investment hedge users (£m)	Proportion of net investment hedge users (%)	Total No of hedge accounting users (£m)	Proportion of hedge accounting users	No of FVTPL users (£m)	Proportion of FVTPL users
2005	1 (1.20)	100.0	0 (0.00)	0.00	0 (0.00)	0.00	1 (1.20)	50.0	2 (4.23)	100.0
2006	1 (1.50)	100.0	1 (0.60)	100.0	0 (0.00)	0.00	1 (2.10)	25.0	4 (22.1)	100.0
2007	2 (52.0)	100.0	1 (0.20)	50.0	0 (0.00)	0.00	2 (52.2)	40.0	4 (26.8)	80.0
2008	1 (17.2)	50.0	1 (3.00)	50.0	0 (0.00)	0.00	2 (20.2)	28.6	6 (75.6)	85.71
2009	0 (0.00)	0.00	2 (19.1)	100.0	0 (0.00)	0.00	2 (19.1)	40.0	4 (142.6)	80.0
2010	0 (0.00)	0.00	2 (22.5)	100.0	0 (0.00)	0.00	2 (22.5)	40.0	5 (115.6)	100.0
2011	0 (0.00)	0.00	3 (32.9)	100.0	0 (0.00)	0.00	3 (32.9)	42.9	6 (195.1)	85.71
2012	0 (0.00)	0.00	4 (36.5)	100.0	0 (0.00)	0.00	4 (36.5)	57.2	7 (79.8)	100.0

Table AP 3.17 shows the hedge accounting use in FTSE 350 oil & gas derivatives users. It shows that hedge accounting was used by all FTSE 100 oil & gas derivatives users from 2005-2012. Nevertheless, FVTPL user proportions were larger and exceeded 80%. An interesting point to note here is the fair value differences between hedged and FVTPL, as they were unusually large. In 2005, FTSE 100 hedged derivatives were worth around £682.08m while FVTPL were over £51b. In 2008, this gap widened to over £70b though by 2012 this came down significantly to just over £15b.

FTSE 250 hedge accounting user proportions were slightly different to FTSE 100 firms. In 2005, this figure was 50%, before declining until 2008 when it reached its' lowest value of 28.6%. During the post-crisis period this trend reversed and climbed up to 57.1% in 2012. However, throughout the study period FVTPL use was common in FTSE 250 firms; this percentage fluctuated between 100% and 80%. Further none of the small firms used net investment hedges either before, during or after the financial crisis.

AP 3.11 Technology

AP 3.11.1 Number of users and respective absolute fair values – Technology

Table AP 3.18 shows that only a limited number of FTSE 100 technology firms used derivatives during the study period, mostly limited to forwards and 'other derivatives'. In FTSE 250 firms, forward contracts were used by the majority of technology firms. Some firms used interest rate swaps regularly although their use was clearly reducing. Further, the following hedge accounting data (Table AP 3.18) shows that the majority of reported FTSE 100 technology fair values did not belong to any of the hedging categories. In FTSE 250 firms, all the firms using hedge accounting used cash flow hedges every year. Further, a majority of FTSE 250 technology firms reported small amounts of FVTPL fair values in their derivatives disclosure section.

Table AP 3.18
Distribution of derivatives instruments – technology

FTSE 100						
Year	No of derivatives users (£m)	No of interest rate swap users (£m)	No of cross currency swap users (£m)	No of forwards users (£m)	No of commodity derivatives users (£m)	No of other derivatives users (£m)
2005	1 (2.43)	0 (0.00)	0 (0.00)	1 (1.71)	0 (0.00)	1 (0.72)
2006	1 (2.06)	0 (0.00)	0 (0.00)	1 (0.44)	0 (0.00)	1 (1.62)
2007	1 (0.72)	0 (0.00)	0 (0.00)	1 (0.50)	0 (0.00)	1 (0.22)
2008	1 (30.8)	0 (0.00)	0 (0.00)	1 (18.5)	0 (0.00)	1 (12.3)
2009	2 (3.24)	1 (9.27)	0 (0.00)	1 (0.46)	0 (0.00)	1 (2.48)
2010	2 (3.50)	1 (28.5)	0 (0.00)	1 (0.20)	0 (0.00)	1 (2.30)
2011	1 (2.70)	0 (0.00)	0 (0.00)	1 (1.50)	0 (0.00)	1 (1.20)
2012	2 (72.2)	0 (0.00)	0 (0.00)	1 (1.40)	0 (0.00)	2 (70.8)

FTSE 250						
Year	No of derivatives users (£m)	No of interest rate swap users (£m)	No of cross currency swap users (£m)	No of forwards users (£m)	No of commodity derivatives users (£m)	No of other derivatives users (£m)
2005	8 (15.4)	4 (6.45)	0 (0.00)	7 (8.96)	0 (0.00)	0 (0.00)
2006	10 (10.2)	5 (2.68)	1 (1.72)	8 (5.77)	0 (0.00)	1 (0.00)
2007	9 (23.6)	3 (0.27)	1 (16.1)	8 (7.17)	0 (0.00)	0 (0.00)
2008	10 (83.5)	4 (6.72)	1 (22.8)	10 (54.0)	0 (0.00)	0 (0.00)
2009	9 (49.1)	2 (5.25)	1 (22.3)	8 (20.8)	0 (0.00)	1 (0.83)
2010	9 (34.7)	2 (1.83)	1 (21.9)	8 (10.9)	0 (0.00)	1 (0.05)
2011	8 (12.6)	1 (1.31)	0 (0.00)	7 (11.3)	0 (0.00)	0 (0.00)
2012	8 (14.1)	1 (3.86)	0 (0.00)	7 (10.3)	0 (0.00)	0 (0.00)

AP 3.11.2 Hedge accounting use – Technology category

Table AP 3.19
FTSE 100 and FTSE 250 hedge accounting use – technology

FTSE 100

Year	No of fair value hedge users (£m)	Proportion of fair value hedge users (%)	No of cash flow hedge users (£m)	Proportion of cash flow hedge users (%)	No of net investment hedge users (£m)	Proportion of net investment hedge users (%)	Total No of hedge accounting users (£m)	Proportion of hedge accounting users	No of FVTPL users (£m)	Proportion of FVTPL users
2005	0 (0.00)	0.00	0 (0.00)	0.00	0 (0.00)	0.00	0 (0.00)	0.00	1 (2.43)	100.0
2006	0 (0.00)	0.00	0 (0.00)	0.00	0 (0.00)	0.00	0 (0.00)	0.00	1 (2.06)	100.0
2007	0 (0.00)	0.00	0 (0.00)	0.00	0 (0.00)	0.00	0 (0.00)	0.00	1 (0.72)	100.0
2008	0 (0.00)	0.00	0 (0.00)	0.00	0 (0.00)	0.00	0 (0.00)	0.00	1 (30.8)	100.0
2009	0 (0.00)	0.00	1 (0.30)	100.0	0 (0.00)	0.00	1 (0.30)	50.0	1 (2.94)	50.0
2010	0 (0.00)	0.00	1 (1.00)	100.0	0 (0.00)	0.00	1 (1.00)	50.0	1 (2.50)	50.0
2011	0 (0.00)	0.00	0 (0.00)	0.00	0 (0.00)	0.00	0 (0.00)	0.00	1 (2.70)	100.0
2012	0 (0.00)	0.00	0 (0.00)	0.00	0 (0.00)	0.00	0 (0.00)	0.00	2 (72.2)	100.0

FTSE 250

Year	No of fair value hedge users (£m)	Proportion of fair value hedge users (%)	No of cash flow hedge users (£m)	Proportion of cash flow hedge users (%)	No of net investment hedge users (£m)	Proportion of net investment hedge users (%)	Total No of hedge accounting users (£m)	Proportion of hedge accounting users	No of FVTPL users (£m)	Proportion of FVTPL users
2005	1 (2.00)	33.3	3 (8.53)	100.0	0 (0.00)	0.00	3 (10.5)	37.50	6 (4.89)	75.0
2006	0 (0.00)	0.00	4 (5.73)	100.0	1 (1.72)	25.0	4 (7.45)	40.0	7 (2.71)	70.0
2007	0 (0.00)	0.00	5 (3.98)	100.0	1 (16.1)	20.0	5 (20.1)	55.56	7 (3.46)	77.8
2008	0 (0.00)	0.00	6 (45.7)	100.0	1 (22.8)	16.7	6 (68.5)	60.00	6 (15.0)	60.0
2009	0 (0.00)	0.00	6 (23.2)	100.0	1 (22.3)	16.7	6 (45.5)	66.7	5 (3.64)	55.6
2010	0 (0.00)	0.00	5 (11.0)	100.0	1 (21.9)	20.0	5 (32.9)	55.56	6 (1.80)	66.7
2011	0 (0.00)	0.00	5 (11.8)	100.0	0 (0.00)	0.00	5 (11.8)	62.50	5 (0.83)	62.5
2012	0 (0.00)	0.00	5 (12.2)	100.0	0 (0.00)	0.00	5 (12.2)	62.50	5 (1.91)	62.5

AP 3.12 Telecommunications

AP 3.12.1 Number of users and their respective absolute fair values – Telecommunications

Table AP 3.20 shows only two FTSE 100 firms in the telecommunications category used derivatives; both firms reported interest rate swaps fair values in their accounts. Like most other industries, none of the FTSE 100 and FTSE 250 firms used commodity derivatives between 2005 and 2012. With the exception of 2005 and 2012, the number of forwards contracts users exceeded the number of other derivatives instruments use in small firms. In this study overall derivatives use in the telecommunications industry varied from 62.5% to 75%. However, Heaney and Winata (2005) reported much lower figures in the Australian telecommunication sector. They examined derivatives use in 1999, and found that only 35.3% of the telecommunication firms used derivatives. Nevertheless, for year 1999 and 2000, Nguyen & Faff (2002) reported a derivatives use figure of 41.7% for Australian telecommunication firms. This is higher than what Heaney and Winata (2005) found in their study.

Table AP 3.20
Distribution of derivatives instruments – telecommunications

FTSE 100

Year	No of derivatives users (£m)	No of interest rate swap users (£m)	No of cross currency swap users (£m)	No of forwards users (£m)	No of commodity derivatives users (£m)	No of other derivatives users (£m)
2005	2 (1,769.0)	2 (593.5)	1 (465.0)	1 (15.0)	0 (0.00)	2 (102.0)
2006	2 (1,885.0)	2 (448.5)	1 (843.0)	1 (19.0)	0 (0.00)	1 (126.0)
2007	2 (2,895.0)	2 (754.0)	1 (965.0)	1 (22.0)	0 (0.00)	1 (400.0)
2008	2 (6,609.0)	2 (1,935.0)	1 (2,560.0)	1 (37.0)	0 (0.00)	2 (142.0)
2009	2 (5,007.0)	2 (1,564.5)	1 (1,602.0)	1 (29.0)	0 (0.00)	1 (247.0)
2010	2 (3,926.0)	2 (1,489.0)	1 (651.0)	1 (14.0)	0 (0.00)	1 (283.0)
2011	2 (5,755.0)	2 (2,328.5)	1 (828.0)	1 (15.0)	0 (0.00)	1 (255.0)
2012	2 (6,314.0)	2 (2,409.0)	2 (1,257.0)	1 (55.0)	0 (0.00)	1 (184.0)

FTSE 250

Year	No of derivatives users (£m)	No of interest rate swap users (£m)	No of cross currency swap users (£m)	No of forwards users (£m)	No of commodity derivatives users (£m)	No of other derivatives users (£m)
2005	3 (18.65)	2 (1.37)	1 (15.0)	1 (2.27)	0 (0.00)	0 (0.00)
2006	4 (26.76)	1 (0.68)	0 (0.00)	4 (26.1)	0 (0.00)	0 (0.00)
2007	4 (24.06)	2 (6.32)	0 (0.00)	4 (17.7)	0 (0.00)	0 (0.00)
2008	3 (229.6)	2 (32.8)	0 (0.00)	3 (55.9)	0 (0.00)	1 (140.9)
2009	3 (164.1)	2 (23.1)	0 (0.00)	3 (16.4)	0 (0.00)	1 (124.6)
2010	3 (172.6)	2 (20.2)	0 (0.00)	3 (17.7)	0 (0.00)	1 (134.8)
2011	3 (185.9)	3 (15.4)	0 (0.00)	3 (14.0)	0 (0.00)	1 (156.5)
2012	4 (187.2)	3 (12.0)	0 (0.00)	2 (5.22)	0 (0.00)	1 (169.9)

AP 3.12.2 Hedge accounting use - Telecommunications category

Table AP 3.21
FTSE 100 and FTSE 250 hedge accounting use - telecommunications

FTSE 100

Year	No of fair value hedge users (£m)	Proportion of fair value hedge users (%)	No of cash flow hedge users (£m)	Proportion of cash flow hedge users (%)	No of net investment hedge users (£m)	Proportion of net investment hedge users (%)	Total No of hedge accounting users (£m)	Proportion of hedge accounting users	No of FVTPL users (£m)	Proportion of FVTPL users
2005	2 (436.0)	100.0	1 (854.0)	50.0	0 (0.00)	0.00	2 (1,290.0)	100.0	2 (479.00)	100.0
2006	2 (347.0)	100.0	1 (1,033.0)	50.0	0 (0.00)	0.00	2 (1,380.0)	100.0	2 (505.00)	100.0
2007	2 (826.0)	100.0	1 (1,174.0)	50.0	0 (0.00)	0.00	2 (2,000.0)	100.0	2 (895.00)	100.0
2008	2 (2,622.0)	100.0	1 (3,016.0)	50.0	0 (0.00)	0.00	2 (5,638.0)	100.0	2 (971.00)	100.0
2009	2 (1,006.0)	100.0	1 (1,989.0)	0.00	0 (0.00)	0.00	2 (2,995.0)	100.0	2 (2,012.00)	100.0
2010	2 (713.0)	100.0	1 (925.0)	50.0	0 (0.00)	0.00	2 (1,638.0)	100.0	2 (2,288.00)	100.0
2011	2 (1,399.0)	100.0	1 (1,287.0)	50.0	0 (0.00)	0.00	2 (2,686.0)	100.0	2 (3,069.00)	100.0
2012	2 (1,275.0)	100.0	1 (1,477.0)	50.0	0 (0.00)	0.00	2 (2,752.0)	100.0	2 (3,562.00)	100.0

FTSE 250

Year	No of fair value hedge users (£m)	Proportion of fair value hedge users (%)	No of cash flow hedge users (£m)	Proportion of cash flow hedge users (%)	No of net investment hedge users (£m)	Proportion of net investment hedge users (%)	Total No of hedge accounting users (£m)	Proportion of hedge accounting users	No of FVTPL users (£m)	Proportion of FVTPL users
2005	0 (0.00)	0.00	2 (3.06)	100.0	0 (0.00)	0.00	2 (3.06)	66.7	2 (15.58)	66.7
2006	1 (0.30)	33.33	2 (4.58)	66.7	0 (0.00)	0.00	3 (4.88)	75.0	2 (21.87)	50.0
2007	1 (3.10)	33.33	3 (8.18)	100.0	0 (0.00)	0.00	3 (11.3)	75.0	2 (12.78)	50.0
2008	0 (0.00)	0.00	2 (61.59)	100.0	0 (0.00)	0.00	2 (61.6)	66.7	2 (167.99)	66.7
2009	0 (0.00)	0.00	2 (38.57)	100.0	0 (0.00)	0.00	2 (38.6)	66.7	2 (125.50)	66.7
2010	0 (0.00)	0.00	2 (29.19)	100.0	0 (0.00)	0.00	2 (29.2)	66.7	2 (143.44)	66.7
2011	0 (0.00)	0.00	2 (23.58)	100.0	0 (0.00)	0.00	2 (23.6)	66.7	2 (162.36)	66.7
2012	0 (0.00)	0.00	3 (17.11)	100.0	0 (0.00)	0.00	3 (17.1)	75.0	2 (170.03)	50.0

Table AP 3.21 shows that both FTSE 100 telecommunication firms using derivatives had their fair values categorised as hedged as well as FVTPL. Both firms used cash flow hedges and none used net investment hedges during the study period. Further, the data shows that cash flow hedges were the most frequently used hedging category in FTSE 250 firms.

AP 3.13 Utilities

AP 3.13.1 Number of users and their respective absolute fair values – Utilities

Table AP 3.22
Distribution of derivatives instruments – utilities

FTSE 100						
Year	**No of derivatives users (£m)**	**No of interest rate swap users (£m)**	**No of cross currency swap users (£m)**	**No of forwards users (£m)**	**No of commodity derivatives users (£m)**	**No of other derivatives users (£m)**
2005	5 (5,818.4)	5 (719.7)	2 (664.0)	3 (124.0)	1 (16.8)	3 (4,293.9)
2006	5 (5,251.2)	5 (581.5)	2 (779.6)	3 (90.0)	0 (0.00)	4 (3,800.1)
2007	5 (8,004.6)	5 (807.5)	2 (1,412.0)	3 (188.0)	0 (0.00)	3 (5,597.1)
2008	5 (15,906.7)	5 (2,119.3)	2 (3,387.1)	4 (883.1)	0 (0.00)	3 (9,517.2)
2009	5 (11,904.6)	5 (1,651.4)	2 (2,590.3)	3 (344.4)	0 (0.00)	4 (7,318.5)
2010	5 (11,882.6)	5 (1,656.2)	2 (1,889.4)	4 (297.8)	0 (0.00)	4 (8,039.2)
2011	5 (9,461.3)	5 (3,419.4)	2 (1,474.9)	4 (188.3)	0 (0.00)	4 (4,378.7)
2012	5 (9,619.3)	5 (4,163.5)	2 (1,373.5)	4 (262.3)	0 (0.00)	4 (3,820.0)

FTSE 250						
Year	**No of derivatives users (£m)**	**No of interest rate swap users (£m)**	**No of cross currency swap users (£m)**	**No of forwards users (£m)**	**No of commodity derivatives users (£m)**	**No of other derivatives users (£m)**
2005	1 (6.10)	1 (6.10)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
2006	1 (16.0)	1 (16.0)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
2007	1 (33.4)	1 (21.5)	0 (0.00)	0 (0.00)	0 (0.00)	1 (11.9)
2008	1 (20.3)	1 (20.3)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
2009	1 (21.1)	1 (21.1)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
2010	1 (28.5)	1 (28.5)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
2011	1 (80.2)	1 (77.9)	0 (0.00)	0 (0.00)	0 (0.00)	1 (2.30)
2012	1 (94.7)	1 (94.7)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)

Table AP 3.22 shows that there are five FTSE 100 utility firms using derivatives throughout the study period and they all used interest rate swaps. In addition, forwards and ‘other derivatives’ were popular with large firms. As only one firm used commodity derivatives in 2005, it is reasonable to assume that utility firms are exposed to small commodity price risk. Given the nature of their business, this was not surprising. In contrast, only one FTSE 250 utility firm showed derivatives fair values in their balance sheet and their use was limited to interest rate swaps.

Bodnar *et al*. (1995) reported that 32% of US transportation and utility firms used derivatives. Further, Nguyen and Faff (2002) showed that 58.8% of the infrastructure and utility firms in Australia used derivatives in year fiscal 1999. Both these studies contrast with this research where all utility firms in the FTSE 350 used derivatives. On the other hand, Berkman *et al*. (1997) reported that by the end of 1996, 73% of the New Zealand transportation and utility firms used derivatives.

AP 3.13.2 Hedge accounting use – Utilities category

Table AP 3.23
FTSE 100 and FTSE 250 hedge accounting use - utilities

FTSE 100										
Year	**No of fair value hedge users (£m)**	**Proportion of fair value hedge users (%)**	**No of cash flow hedge users (£m)**	**Proportion of cash flow hedge users (%)**	**No of net investment hedge users (£m)**	**Proportion of net investment hedge users (%)**	**Total No of hedge accounting users (£m)**	**Proportion of hedge accounting users**	**No of FVTPL users (£m)**	**Proportion of FVTPL users**
2005	4 (459.0)	80.0	4 (830.6)	80.0	2 (357.0)	40.0	5 (1,646.6)	100.0	5 (4,171.8)	100.0
2006	5 (521.1)	100.0	4 (699.6)	80.0	2 (325.0)	40.0	5 (1,545.7)	100.0	5 (3,705.5)	100.0
2007	4 (567.8)	80.0	4 (985.2)	80.0	2 (450.0)	40.0	5 (2,003.0)	100.0	5 (6,001.6)	100.0
2008	5 (1,912.4)	100.0	4 (1,697.1)	80.0	2 (1,245.0)	40.0	5 (4,854.5)	100.0	5 (11,052.2)	100.0
2009	5 (1,369.2)	100.0	4 (1,484.5)	80.0	1 (842.0)	20.0	5 (3,695.7)	100.0	5 (8,208.9)	100.0
2010	5 (1,076.7)	100.0	4 (961.6)	80.0	1 (538.0)	20.0	5 (2,576.3)	100.0	5 (9,306.3)	100.0
2011	5 (1,405.1)	100.0	4 (817.8)	80.0	1 (413.0)	20.0	5 (2,635.9)	100.0	5 (6,825.4)	100.0
2012	5 (1,592.8)	100.0	4 (812.9)	80.0	1 (393.0)	20.0	5 (2,798.7)	100.0	5 (6,820.6)	100.0

FTSE 250										
Year	**No of fair value hedge users (£m)**	**Proportion of fair value hedge users (%)**	**No of cash flow hedge users (£m)**	**Proportion of cash flow hedge users (%)**	**No of net investment hedge users (£m)**	**Proportion of net investment hedge users (%)**	**Total No of hedge accounting users (£m)**	**Proportion of hedge accounting users**	**No of FVTPL users (£m)**	**Proportion of FVTPL users**
2005	0 (0.00)	0.00	1 (6.10)	100.0	0(0.00)	0.00	1 (6.10)	100.0	0 (0.00)	0.00
2006	0 (0.00)	0.00	1 (16.0)	100.0	0 (0.00)	0.00	1 (16.0)	100.0	0 (0.00)	0.00
2007	0 (0.00)	0.00	1 (21.5)	100.0	0 (0.00)	0.00	1 (21.5)	100.0	1 (11.9)	100.0
2008	0 (0.00)	0.00	1 (18.1)	100.0	0 (0.00)	0.00	1 (18.1)	100.0	1 (2.20)	100.0
2009	0 (0.00)	0.00	1 (21.0)	100.0	0 (0.00)	0.00	1 (21.0)	100.0	1 (0.10)	100.0
2010	1 (3.50)	100.0	1 (25.0)	100.0	0 (0.00)	0.00	1 (28.5)	100.0	0 (0.00)	0.00
2011	1 (29.2)	100.0	1 (48.7)	100.0	0 (0.00)	0.00	1 (77.9)	100.0	1 (2.30)	100.0
2012	1 (40.2)	100.0	1 (41.9)	100.0	0 (0.00)	0.00	1 (82.1)	100.0	1 (12.6)	100.0

Table AP 3.23 shows that all utility derivative users in FTSE 100 and FTSE 250 used hedge accounting. Fair value and cash flow hedges were the largest contributor to total FTSE 100 utilities fair values accounted under hedge accounting. Additionally, all FTSE 100 firms reported derivatives fair values in FVTPL for each year in the study period. The only FTSE 250 firm reported derivatives fair values, used cash flow hedges throughout the study period and fair values hedges from 2010 to 2012.

Appendix 4: Value relevance of different derivative instruments types

AP 4.1 Proportion of derivatives users under different industries

AP 4.1.1 Summary Statistics

Table AP 4.1
Summary statistics - Value relevance of different derivative instrument types (2005 - 2012)

	No. obs.	Mean	Std. Dev.	Median	Min	Max
Panel A1: Firms with interest rate swaps						
Total assets (millions)	937	10,900.00	26,400.00	2483.50	50.75	219,000.00
Total sales (millions)	937	9,332.55	28,000.00	2,030.50	0.000	293,000.00
Market value of the firm (millions)	929	9,498.95	21,200.00	1,849.96	54.23	146,000.00
Firm Value measure						
Firm_Value	929	1.03852	0.95089	0.79662	0.02325	12.83548
Log of Firm_Value	929	-0.22343	0.73124	-0.22738	-3.76163	2.55221
Control variables						
Firm size	937	14.87858	1.55914	14.72518	10.83473	19.20594
Dividend pay out	929	0.91819	0.27422	1.00000	0.00000	1.00000
Capital Expenditure	936	0.04841	0.04192	0.03824	0.00000	0.29878
Return on Assets	936	0.07501	0.07933	0.06841	-0.83574	0.54493
Leverage	937	0.29154	0.15981	0.27226	0.00000	1.34547
R&D expenses	491	0.02491	0.05395	0.00310	0.00000	0.47989
Quick Ratio	937	0.83130	1.65466	0.75364	0.00000	50.00000
Panel A2: Firms without interest rate swaps						
Total assets (millions)	849	1,514.25	3,203.36	622.20	11.39	61,200.00
Total sales (millions)	848	1,386.71	2,600.87	583.84	0.000	29,200.00
Market value of equity (millions)	806	1,778.32	2,980.06	807.11	35.09	27,900.00
Firm Value measure						
Firm_Value	806	2.01765	2.78235	1.40574	0.04849	46.91417
Log of Firm_Value	806	0.33828	0.82072	0.34056	-3.02631	3.84832
Control variables						
Firm size	849	13.34820	1.30949	13.34102	9.34040	17.93039
Dividend pay out	839	0.77592	0.41722	1.00000	0.00000	1.00000
Capital Expenditure	848	0.05660	0.05770	0.03663	0.00000	0.61849
Return on Assets	848	0.12397	0.17215	0.10960	-0.38779	2.71828
Leverage	849	0.14946	0.16809	0.10306	0.00000	1.07558
R&D expenses	372	0.06691	0.09819	0.02409	0.00000	0.58541
Quick Ratio	849	1.61535	2.86927	1.04954	0.03265	46.08419

Panel B1: Firms with cross Currency Swaps						
Total assets (millions)	444	15,400.00	32,200.00	3,800.75	156.53	219,000.00
Total sales (millions)	444	14,100.00	37,800.00	3,582.00	0.000000	4788.426
Market value of equity (millions)	443	13,700.00	25,900.00	3,578.63	85.85	146,000.00
Firm Value measure						
Firm_Value	443	1.10498	1.05693	0.80293	0.04849	10.82387
Log of Firm_Value	443	-0.17618	0.72153	-0.21949	-3.02631	2.38175
Control variables						
Firm size	444	15.34103	1.54441	15.15070	11.96103	19.20594
Dividend pay out	443	0.95485	0.20786	1.00000	0.00000	1.00000
Capital Expenditure	444	0.04752	0.03690	0.039223	0.00000	0.25557
Return on Assets	444	0.08073	0.06857	0.07249	-0.24808	0.33263
Leverage	444	0.29628	0.15705	0.27994	0.00000	1.17754
R&D expenses	260	0.01657	0.03073	0.00278	0.00000	0.15161
Quick Ratio	444	0.92430	2.36622	0.77945	0.00000	50.00000
Panel B2: Firms without cross Currency Swaps						
Total assets (millions)	1,342	3,483.88	12,000.00	889.37	11.39	156,000.00
Total sales (millions)	1,341	2,740.12	8,390.88	784.60	0.00	169,000.00
Market value of equity (millions)	1,292	3,236.46	9,436.79	949.05	35.09	116,000.00
Firm Value measure						
Firm_Value	1,292	1.62655	2.31206	1.12853	0.02325	46.91417
Log of Firm_Value	1,292	0.11079	0.84295	0.12092	-3.76163	3.84832
Control variables						
Firm size	1,342	13.75733	1.46526	13.69827	9.34040	18.86506
Dividend pay out	1,325	0.81585	0.38775	1.00000	0.00000	1.00000
Capital Expenditure	1,340	0.05389	0.05380	0.03722	0.00000	0.61849
Return on Assets	1,340	0.10410	0.14915	0.09239	-0.83574	2.71828
Leverage	1,342	0.20009	0.17874	0.17410	0.00000	1.34547
R&D expenses	603	0.05442	0.08996	0.01622	0.00000	0.58540
Quick Ratio	1,342	1.29655	2.33177	0.88488	0.03264	46.08419
Panel C1: Firms with forwards contracts						
Total assets (millions)	1,023	8,711.62	22,900.00	1,726.08	40.50	219,000.00
Total sales (millions)	1,023	8,269.83	26,800.00	1,634.60	0.000	293,000.00
Market value of the firm (millions)	1,005	8,310.031	19,500.00	1,603.21	35.09	146,000.00
Firm Value measure						
Firm_Value	1,005	1.34442	1.22214	1.00515	0.02719	12.83548
Log of Firm_Value	1,005	0.01405	0.75152	0.00514	-3.60498	2.55221
Control variables						
Firm size	1,023	14.50301	1.66076	14.36136	10.60906	19.20594
Dividend pay out	1,016	0.90453	0.29401	1.00000	0.00000	1.00000
Capital Expenditure	1,022	0.04818	0.04110	0.03614	0.00000	0.33943
Return on Assets	1,022	0.09746	0.09236	0.08725	-0.83574	0.74128
Leverage	1,023	0.22848	0.16017	0.22505	0.00000	1.34547
R&D expenses	609	0.04249	0.07080	0.01394	0.00000	0.47989
Quick Ratio	1,023	1.04188	1.67880	0.85549	0.00000	50.0000

Panel C2: Firms without forwards contracts						
Total assets (millions)	763	3,393.18	14,200.00	847.00	11.39	156,000.00
Total sales (millions)	762	1,916.66	4,792.79	719.10	0.000	46,400.00
Market value of equity (millions)	730	2,611.33	8,651.55	867.57	38.72	91,300.00
Firm Value measure						
Firm_Value	730	1.69846	2.85260	1.06645	0.02325	46.91417
Log of Firm_Value	730	0.06982	0.91193	0.06433	-3.76163	3.84832
Control variables						
Firm size	763	13.67913	1.47465	13.64946	9.34040	18.86506
Dividend pay out	752	0.77793	0.41592	1.00000	0.00000	1.00000
Capital Expenditure	762	0.05784	0.05987	0.04103	0.00000	0.61849
Return on Assets	762	0.09939	0.17514	0.07748	-0.38779	2.71828
Leverage	763	0.21800	0.20036	0.17740	0.00000	1.17754
R&D expenses	254	0.04427	0.09593	0.00165	0.00000	0.58541
Quick Ratio	763	1.42139	3.00360	0.86709	0.032645	46.08419

Panel D1: Firms with commodity contracts						
Total assets (millions)	219	23,300.00	43,400.00	5,479.66	151.75	219,000.00
Total sales (millions)	219	23,100.00	53,600.00	4,619.00	0.00	293,000.00
Market value of the firm (millions)	215	20,900.00	34,400.00	3,826.83	54.23	146,000.00
Firm Value measure						
Firm_Value	215	1.14538	1.05361	0.86476	0.09258	7.99561
Log of Firm_Value	215	-0.14621	0.74643	-0.14530	-2.37973	2.07889
Control variables						
Firm size	219	15.63996	1.69288	15.51655	11.93002	19.20594
Dividend pay out	218	0.82110	0.38415	1.00000	0.00000	1.00000
Capital Expenditure	219	0.07630	0.05258	0.06805	0.00843	0.33943
Return on Assets	218	0.09145	0.08486	0.07491	-0.13518	0.48454
Leverage	219	0.21753	0.11866	0.21933	0.00000	0.56382
R&D expenses	154	0.00909	0.01710	0.00194	0.00000	0.08397
Quick Ratio	219	1.07526	0.91170	0.86385	0.11679	6.50840

Panel C2: Firms without commodity contracts						
Total assets (millions)	1,567	4,085.38	11,800.00	1,006.08	11.39	156,000.00
Total sales (millions)	1,566	3,104.36	6,461.13	964.85	0.000	64,800.00
Market value of equity (millions)	1,520	3,787.24	9,610.49	1,036.95	35.09	91,300.00
Firm Value measure						
Firm_Value	1,520	1.54260	2.17978	1.06929	0.02325	46.91417
Log of Firm_Value	1,520	0.06350	0.83026	0.06699	-3.76163	3.84832
Control variables						
Firm size	1,567	13.94295	1.51502	13.82157	9.34040	18.86506
Dividend pay out	1,550	0.85484	0.35238	1.00000	0.00000	1.00000
Capital Expenditure	1,565	0.04895	0.04894	0.03543	0.00000	0.61849
Return on Assets	1,566	0.09924	0.13955	0.08507	-0.83574	2.71828

Leverage	1,567	0.22491	0.18531	0.20764	0.00000	1.34547
R&D expenses	709	0.05038	0.08500	0.01497	0.00000	0.58541
Quick Ratio	1,567	1.22200	2.48012	0.85710	0.00000	50.0000

Panel E1: Firms with other derivative contracts

Total assets (millions)	443	16,700.00	36,300.00	2,684.20	40.50	219,000.00
Total sales (millions)	443	14,600.00	38,800.00	2,719.87	1.85	293,000.00
Market value of the firm (millions)	427	15,000.00	28,500.00	2,460.19	101.55	146,000.00
Firm Value measure						
Firm_Value	427	1.24460	1.06814	0.94954	0.02719	7.59257
Log of Firm_Value	427	-0.08368	0.81005	-0.05177	-3.60498	2.02717
Control variables						
Firm size	443	15.08626	1.79840	14.80289	10.60906	19.20594
Dividend pay out	437	0.90389	0.29508	1.00000	0.00000	1.00000
Capital Expenditure	442	0.05768	0.04340	0.04912	0.00000	0.24474
Return on Assets	443	0.09348	0.09701	0.08579	-0.31880	0.64475
Leverage	443	0.27480	0.18909	0.24475	0.00000	1.34547
R&D expenses	211	0.02781	0.06514	0.00277	0.00000	0.34279
Quick Ratio	443	0.93584	0.84342	0.75588	0.08105	9.37280

Panel E2: Firms without other derivative contracts

Total assets (millions)	1,343	3,071.47	6,470.58	927.20	11.39	64,000.00
Total sales (millions)	1,342	2,585.00	6,536.44	855.27	0.00	135,000.00
Market value of equity (millions)	1,308	2,953.07	6,590.44	957.67	35.09	67,000.00
Firm Value measure						
Firm_Value	1,308	1.57459	2.30824	1.06220	0.02325	46.91417
Log of Firm_Value	1,308	0.07708	0.82369	0.06034	-3.76163	3.84832
Control variables						
Firm size	1343	13.84254	1.45158	13.73992	9.34040	17.97449
Dividend pay out	1331	0.83321	0.37293	1.00000	0.00000	1.00000
Capital Expenditure	1342	0.05053	0.05214	0.03483	0.00000	0.61849
Return on Assets	1341	0.09987	0.14424	0.08232	-0.83574	2.71828
Leverage	1343	0.20725	0.17163	0.18880	0.00000	0.95360
R&D expenses	652	0.04794	0.08241	0.01526	0.00000	0.58541
Quick Ratio	1343	1.29247	2.65517	0.91258	0.00000	50.00000

Table AP 4.1 shows the summary statistics of the main variables used to identify the value relevance of different instruments types. Data included the FTSE 350 non-financial firms listed in the London Stock Exchange from year 2005 to 2012. Firm value described as the market value of firm assets divided by the replacement cost of assets. Market value of firm proxies by the Market Capitalization while replacement cost defined as the book value of total assets. Derivatives user dummy equals 1 if firm used derivatives, zero otherwise. Hedge variable is defined as the fair value derivatives scaled by the total assets. The size of the firm is defined as the log of the total assets where total assets represent the sum of total current assets, long term receivables, investment in unconsolidated subsidiaries, other investments, net property plant and equipment and other assets. Dividend determined by a dummy with a value 1 if dividends per share is positive zero otherwise. Capital expenditure were examined using the ratio of capital expenditures total assets. Return on assets defined by the ratio of net income to total assets. Leverage is defined as the total debt divided by total assets. Research & Development measured by R&D expenses cost scaled by net sales. Quick ratio measured by the total of cash & equivalents and net receivables over current liabilities. Panel A1 shows the descriptive statistics of firms with interest rate swaps while panel B1 shows the descriptive statistics of firms without interest rate swaps. Similarly Panel B1, Panel B2, Panel C1, Panel C2, Panel D1, Panel D2, Panel E1 and Panel E2 show the descriptive statistics of firms with cross Currency Swaps, firms without cross Currency Swaps, firms with forwards, firms without forwards, firms with commodity derivatives, firms without commodity derivatives, firms with other derivatives and firms without other derivatives respectively.

Table AP 4.1 presents the distribution of different derivative instrument categories in the data set, which includes non-financial firms listed in the London Stock Exchange from year 2005 to 2012. Panel A1 to Panel E2 exhibit the cross sectional variation in the use of interest rate swaps, cross Currency Swaps, forwards, commodity derivatives and other derivatives respectively. Mean values of assets ranged from £8,711.6 millions (forward currency contracts) to £23,300 millions (commodity derivatives) while mean value of sales ranged from £8,269.83 millions (forward currency contracts) £14,600 millions (commodity contracts).

In terms of firm values by different derivative instrument categories, data show that on average for Interest rate swap, cross currency swap, forwards, commodity derivative and other derivatives instruments, firm values of non-users are higher than their user counter parts.

While above results suggest a negative relationship between derivative use and firm value, even after disaggregating their relevant fair value into respective derivative instrument categories, this descriptive analysis do not control for individual firm level characteristics known to have an impact on firm value. The important firm characteristics include the firm size, dividend payout ratio, amount spend as capital expenditure, return on assets, leverage, R&D investments, availability of liquidity assets. Therefore in order to detach the effects of derivative use on firm value, it is necessary to control for these firm specific characteristics. This has been carried out as a two stage process. Initially using univariate analysis examined the mean differences between different derivative instrument user and non-user categories. Secondly this has been extended to multivariate analysis where Pooled OLS and fixed effects models have been used to adjust for control variables.

AP 4.2 Value relevance of different hedging categories

AP 4.2.1 Summary Statistics

Table AP 4.2

Summary statistics - Value relevance of different hedging categories (2005 - 2012)

	No. obs.	Mean	Std. Dev.	Median	Min	Max
Panel A1: Firms with fair value hedges						
Total assets (millions)	481	18,900.00	34,900.00	5,458.00	282.60	219,000.00
Total sales (millions)	481	16,300.00	37,700.00	5,624.00	0.000	293,000.00
Market value of equity (millions)	476	16,500.00	27,500.00	4,446.91	113.95	146,000.00
Fair value hedge use measure						
Fair value hedges user dummy	481	1.00	0.00	1.00	1.00	1.00
Firm Value measure						
Firm_Value	476	1.04769	0.98562	0.77177	0.02325	10.82387
Log of Firm_Value	476	-0.21488	0.71320	-0.25906	-3.76163	2.38175
Control variables						
Firm size	481	15.63627	1.52537	15.51259	12.55179	19.20594
Dividend pay out	480	0.93542	0.24605	1.00000	0.00000	1.00000
Capital Expenditure	481	0.04948	0.03350	0.04280	0.00000	0.17048
Return on Assets	480	0.08068	0.07528	0.07158	-0.32706	0.35198
Leverage	481	0.29324	0.15466	0.26627	0.00000	1.17754
R&D expenses	291	0.01602	0.03585	0.00170	0.00000	0.24219
Quick Ratio	481	0.90662	2.28280	0.77163	0.00000	50.00000
Panel A2: Firms without fair value hedges						
Total assets (millions)	1,305	1,843.67	3,252.50	813.40	11.39	31,800.00
Total sales (millions)	1,304	1602.72	2745.91	717.51	0.000	27,400.00
Market value of equity (millions)	1,259	1894.76	3555.01	882.10	35.09	53,900.00
Firm Value measure						
Firm_Value	1,259	1.66188	2.34080	1.15262	0.02719	46.91417
Log of Firm_Value	1,259	0.13294	0.84169	0.14203	-3.60498	3.84832
Control variables						
Firm size	1,305	13.60361	1.29993	13.60898	9.34040	17.27425

Dividend pay out	1,288	0.81910	0.38509	1.00000	0.00000	1.00000
Capital Expenditure	1,303	0.05335	0.05507	0.03597	0.00000	0.61849
Return on Assets	1,304	0.10476	0.14953	0.09350	-0.83574	2.71828
Leverage	1,305	0.19848	0.17994	0.17027	0.00000	1.34547
R&D expenses	572	0.05675	0.09057	0.01867	0.00000	0.58541
Quick Ratio	1,305	1.31362	2.35926	0.90756	0.03265	46.08419
Panel B1: Firms with cash flow hedges						
Total assets (millions)	1,102	7,302.85	20,500.00	1,727.55	43.56	219,000.00
Total sales (millions)	1,102	6,960.27	23,700.00	1,506.79	-	293,000.00
Market value of equity (millions)	1,090	6,565.22	16,700.00	1,347.92	35.09	146,000.00
Cash flow hedges use measure						
Cash flow hedges user dummy	1,102	1.00	0.00	1.00	1.00	1.00
Firm Value measure						
Firm_Value	1,090	1.21705	1.11122	0.89697	0.02719	12.83548
Log of Firm_Value	1,090	-0.10026	0.77996	-0.10873	-3.60498	2.55221
Control variables						
Firm size	1,102	14.46826	1.51244	14.36221	10.68189	19.20594
Dividend pay out	1,096	0.92336	0.26614	1.00000	0.00000	1.00000
Capital Expenditure	1,101	0.05036	0.04195	0.04016	0.00000	0.33943
Return on Assets	1,101	0.08996	0.08790	0.07803	-0.83574	0.54493
Leverage	1,102	0.25213	0.16773	0.23891	0.00000	1.34547
R&D expenses	581	0.02879	0.05666	0.00724	0.00000	0.47989
Quick Ratio	1,102	0.93692	1.59937	0.81462	0.00000	50.00000
Panel B2: Firms without cash flow hedges						
Total assets (millions)	684	5,048.62	18,600.00	709.47	11.39	191,000.00
Total sales (millions)	683	3,294.75	14,500.00	606.32	0.000	249,000.00

Market value of equity (millions)	645	4,808.94	14,900.00	919.94	38.72	131,000.00
Firm Value measure						
Firm_Value	645	1.96035	3.03093	1.30221	0.02325	46.91417
Log of Firm_Value	645	0.27035	0.84192	0.26406	-3.76163	3.84832
Control variables						
Firm size	684	13.63995	1.69592	13.47223	9.34040	19.06833
Dividend pay out	672	0.73214	0.44317	1.00000	0.00000	1.00000
Capital Expenditure	683	0.05544	0.06110	0.03502	0.00000	0.61849
Return on Assets	683	0.11170	0.18506	0.09614	-0.38779	2.71828
Leverage	684	0.17868	0.18590	0.13863	0.00000	1.07558
R&D expenses	282	0.07233	0.10595	0.02279	0.00000	0.58541
Quick Ratio	684	1.63432	3.15444	0.98642	0.03265	46.08419

Panel C1: Firms with net investment hedges

Total assets (millions)	310	10,600.00	18,300.00	2,683.95	156.53	156,000.00
Total sales (millions)	310	9,215.30	19,900.00	2,817.40	78.77	196,000.00
Market value of the firm (millions)	309	10,700.00	19,800.00	2,602.99	64.72	122,000.00
Net investment hedges use measure						
Net investment hedges user dummy	310	1.00	0.00	1.00	1.00	1.00
Firm Value measure						
Firm_Value	309	0.97702	0.57315	0.83171	0.10023	3.42206
Log of Firm_Value	309	-0.19379	0.60957	-0.18427	-2.30024	1.23024
Control variables						
Firm size	310	15.12252	1.47854	14.80280	11.96103	18.86756
Dividend pay out	309	0.95146	0.21526	1.00000	0.00000	1.00000
Capital Expenditure	310	0.04164	0.02805	0.03624	0.00000	0.14375
Return on Assets	309	0.07675	0.06179	0.07218	-0.19990	0.33047
Leverage	310	0.29859	0.16083	0.27679	0.00000	1.34547
R&D expenses	187	0.02515	0.04112	0.00875	0.00000	0.28968

Quick Ratio	310	0.81747	0.35561	0.77392	0.11679	1.88864
Panel C2: Firms without net investment hedges						
Total assets (millions)	1,476	5,559.83	20,000.00	962.98	11.39	219,000.00
Total sales (millions)	1,475	4,789.01	20,900.00	877.50	0.000	293,000.00
Market value of equity (millions)	1,426	4,866.94	15,000.00	1,047.82	35.09	146,000.00
Firm Value measure						
Firm_Value	1,426	1.60527	2.26077	1.08624	0.02325	46.91417
Log of Firm_Value	1,426	0.08764	0.85432	0.08272	-3.76163	3.84832
Control variables						
Firm size	1,476	13.94700	1.59299	13.77778	9.34040	19.20594
Dividend pay out	1,459	0.82934	0.37634	1.00000	0.00000	1.00000
Capital Expenditure	1,474	0.05455	0.05344	0.03921	0.00000	0.61849
Return on Assets	1,475	0.10280	0.14433	0.08853	-0.83574	2.71828
Leverage	1,476	0.20834	0.17808	0.18155	0.00000	1.07558
R&D expenses	676	0.04796	0.08594	0.01042	0.00000	0.58541
Quick Ratio	1,476	1.28519	2.56742	0.87627	0.00000	50.00000
Panel D1: Firms with FVTPL Derivatives						
Total assets (millions)	919	11,000.00	26,600.00	2,386.80	40.50	219,000.00
Total sales (millions)	919	9,617.07	28,300.00	2,292.00	0.000	293,000.00
Market value of the firm (millions)	896	9,973.83	21,400.00	2,186.79	39.99	146,000.00
FVTPL Derivatives use measure						
FVTPL Derivatives user dummy	919	1.00	0.00	1.00	1.00	1.00
Firm Value measure						
Firm_Value	896	1.24438	1.21618	0.90809	0.02325	12.83548
Log of Firm_Value	896	-0.08419	0.77217	-0.09641	-3.76163	2.55221
Control variables						

Firm size	919	14.78780	1.69361	14.68546	10.60906	19.20594
Dividend pay out	909	0.88559	0.31849	1.00000	0.00000	1.00000
Capital Expenditure	918	0.04986	0.04361	0.03692	0.00000	0.33943
Return on Assets	918	0.08423	0.09665	0.07543	-0.83574	0.74128
Leverage	919	0.25047	0.17671	0.23090	0.00000	1.34547
R&D expenses	507	0.03834	0.06726	0.00702	0.00000	0.34279
Quick Ratio	919	1.05303	1.80314	0.82180	0.00000	50.00000
Panel C2: Firms without FVTPL Derivatives						
Total assets (millions)	867	1,584.15	3,194.74	691.40	11.39	44,300.00
Total sales (millions)	866	1,249.93	2,042.70	715.10	0.000	18,100.00
Market value of equity (millions)	839	1,574.85	2,803.47	796.91	35.09	27,900.00
Firm Value measure						
Firm_Value	839	1.75929	2.68605	1.19055	0.03209	46.91417
Log of Firm_Value	839	0.16749	0.85565	0.17442	-3.43926	3.84832
Control variables						
Firm size	867	13.47608	1.25859	13.44647	9.34040	17.60717
Dividend pay out	859	0.81374	0.38955	1.00000	0.00000	1.00000
Capital Expenditure	866	0.05490	0.05626	0.03966	0.00000	0.61849
Return on Assets	866	0.11318	0.16346	0.09538	-0.38779	2.71828
Leverage	867	0.19595	0.17613	0.16638	0.00000	0.87859
R&D expenses	356	0.04968	0.09285	0.01354	0.00000	0.58541
Quick Ratio	867	1.36405	2.80010	0.91028	0.03265	46.08419

Table AP 4.2 shows the summary statistics of the main variables used to identify the value relevance of different hedging categories. Data included the FTSE 350 non-financial firms listed in the London Stock Exchange from year 2005 to 2012. Firm value described as the market value of firm assets divided by the replacement cost of assets. Market value of firm proxies by the Market Capitalization while replacement cost defined as the book value of total assets. Derivatives user dummy equals 1 if firm used derivatives, zero otherwise. Hedge variable is defined as the fair value derivatives scaled by the total assets. The size of the firm is defined as the log of the total assets where total assets represent the sum of total current assets, long term receivables, investment in unconsolidated subsidiaries, other investments, net property plant and equipment and other assets. Dividend determined by a dummy with a value 1 if dividends per share is positive zero otherwise. Capital expenditure were examined using the ratio of capital expenditures total assets. Return on assets defined by the ratio of net income to total assets. Leverage is defined as the total debt divided by total assets. Research & Development measured by R&D expenses cost scaled by net sales. Quick ratio measured by the total of cash & equivalents and net receivables over current liabilities. Panel A1 shows the descriptive statistics of firms with fair value hedge derivatives while panel B1 shows the descriptive statistics of firms without fair value hedge derivatives. Similarly Panel B1, Panel B2, Panel C1, Panel C2 and Panel D1, Panel D2 show the descriptive statistics of firms with cash flow hedge derivatives, firms without cash flow hedge derivatives, firms with net investment hedge derivatives, firms without net investment hedge derivatives, firms with FVTPL derivatives, firms without FVTPL derivatives respectively.

Table AP 4.2 presents the distribution of different hedging category fair values in the data set, which includes non-financial firms listed in the London Stock Exchange from year 2005 to 2012. Panel A1 shows the cross sectional variation of fair value hedge users while A2 shows the cross sectional variation of the firms that did not use fair value hedges. Similarly panel B1 to D2 show the cross sectional variation of cash flow hedge users, cash flow hedge non users, net investment hedge users, net investment hedge non users, FVTPL users and FVTPL non users respectively. The mean value of assets for firms using fair value hedges were £18,900 millons while firms not using fair value hedges were £1,843.67 millions. Likewise, firms using CF hedges, NI hedges and FVTPL, all had a higher mean asset values than non users. Similar results were seen with mean sales values where hedge accounting and FVTPL users had a higher mean sales figures.

Above results indicate a negative relationship between derivative use and firm value even once disaggregating their relevant fair values in to respective hedging categories and FVTPL derivatives. For FV value hedges, firms with FV hedges reported a firm value of 1.04769; however firms without FV hedges showed a much higher firm value (1.66188). Similar results were seen with other 2 hedging categories and with FVTPL derivatives. Nevertheless simple mean value comparison could not control for individual firm level characteristics having an influence on firm value. Therefore section AP 4.2 extended the analyses in chapter 5 to univariate analysis where mean differences between different hedging category users and non-users have been examined over firm size, dividend payout ratio, amount spend as capital expenditure, return on assets, leverage, R&D investments, availability of liquidity assets. It is essential to control for these firm specific characteristics in estimating the effects of using FV, CF, NI and FVTPL use on firm value.

Bibliography and references

Acharya,V.V., and Richardson, M. (2009) *Restoring Financial Stability: How to Repair a Failed System*, New Jersey: John Wiley & Sons.

Adam, T. R., and Fernando, C. S. (2006). Hedging, speculation, and shareholder value. *Journal of Financial Economics*, *81*(2), 283-309.

Adam, T.R., Fernando, C.S. and Golubeva, E., (2015). Managerial overconfidence and corporate risk management. *Journal of Banking & Finance*, 60, 195-208.

Adrian, T., and Shin, H. S. (2010). Liquidity and leverage. *Journal of financial intermediation*, *19*(3), 418-437.

Aebi, V., Sabato, G., and Schmid, M. (2012). Risk management, corporate governance, and bank performance in the financial crisis. *Journal of Banking & Finance*, *36*(12), 3213-3226.

Afza, T., and Alam, A. (2011). Corporate derivatives and foreign exchange risk management: A case study of non-financial firms of Pakistan. *The Journal of Risk Finance*, *12*(5), 409-420.

Aggarwal, R., and Simkins, B. J. (2004). Evidence on voluntary disclosures of derivatives usage by large US companies. *Journal of Derivatives Accounting*, *1*(01), 61-81.

Aggarwal, R., and Zhao, X. (2007). The leverage–value relationship puzzle: An industry effects resolution. *Journal of Economics and Business*, *59*(4), 286-297.

Ahmed, A. S., Beatty, A., and Takeda, C. (1997). Evidence on interest rate risk management and derivatives usage by commercial banks. (Working paper, University of Rochester). Rochester, NY.

Ahmed, A. S., Kilic, E., and Lobo, G. J. (2006). Does recognition versus disclosure matter? Evidence from value-relevance of banks' recognized and disclosed derivative financial instruments. *The Accounting Review*, *81*(3), 567-588.

Ahmed, A. S., Kilic, E., and Lobo, G. J. (2011). Effects of SFAS 133 on the risk relevance of accounting measures of banks' derivative exposures. *The Accounting Review*, *86*(3), 769-804.

Akhigbe, A., Martin, A. D., and Newman, M. (2008). Risk Shifts Following Sarbanes-Oxley: Influences of Disclosure and Governance. *Financial Review*, *43*(3), 383-401.

Alkebäck, P., and Hagelin, N. (1999). Derivative usage by nonfinancial firms in Sweden with an international comparison. *Journal of International Financial Management & Accounting*, *10*(2), 105-120

Alkebäck, P., Hagelin, N., and Pramborg, B. (2006). Derivative usage by non-financial firms in Sweden 1996 and 2003: what has changed?. *Managerial Finance*, *32*(2), 101-114.

Alkebdck, G. M., and Gebhardt, G. (1999). Derivatives Usage in Risk Management by US and German Non-Financial Firms: A Comparative Survey. *Journal of International Financial Management & Accounting*, 10(3), 153-187.

Allayannis, G., and E. Ofek. (2001), Exchange Rate Exposure, Hedging, and the User of Foreign Currency Derivatives, *Journal of International Money and Finance*, 20(2), pp. 273-296

Allayannis, G., and Weston, J. P. (2001). The use of foreign currency derivatives and firm market value. *The review of financial studies*, *14*(1), 243-276.

Allayannis, G., Lel, U., and Miller, D. P. (2012). The use of foreign currency derivatives, corporate governance, and firm value around the world. *Journal of International Economics*, *87*(1), 65-79.

Allee, K. D., and DeAngelis, M. D. (2015). The structure of voluntary disclosure narratives: Evidence from tone dispersion. *Journal of Accounting Research*, *53*(2), 241-274.

Allen, S., Kim, S., and Zitzler, M. (2012). Hedging instrument in post liquidity crisis: a case of interest rate swaps. *Managerial Finance*, *39*(1), 47-59.

Alsubaie, A.N., (2009). CEO Overconfidence and Corporate Derivative Hedging Decisions. *International Review of Business Research Papers*, 5(6), 22-32.

Altınkılıç, O., Balashov, V. S., and Hansen, R. S. (2013). Are analysts' forecasts informative to the general public?. *Management Science*, *59*(11), 2550-2565.

Ameer, R. (2009). Value-relevance of foreign-exchange and interest-rate derivatives disclosure: The case of Malaysian firms. *The Journal of Risk Finance*, *10*(1), 78-90.

Amemiya, T. (1981). *Qualitative response models: A survey*. *Journal of Econometric Literature*, 19(1), 1483-1536

Amir, E., Harris, T. S., and Venuti, E. K. (1993). A comparison of the value-relevance of US versus non-US GAAP accounting measures using form 20-F reconciliations. *Journal of Accounting Research*, 31(1), 230-264.

Ammon, N., (1998). Why Hedge?-A Critical Review of Theory and Empirical Evidence (No. 98-18). *ZEW Discussion Papers*.

Anderson, B. P., Makar, S. D., and Huffman, S. H. (2004). Exchange rate exposure and foreign exchange derivatives: do ineffective hedgers modify future derivatives use?. *Research in International Business and Finance*, 18(2), 205-216.

Ang, J. S., Chua, J. H., and McConnell, J. J. (1982). The administrative costs of corporate bankruptcy: A note. *The Journal of Finance*, 37(1), 219-226.

Aragon, G. O., and Martin, J. S. (2012). A unique view of hedge fund derivatives usage: Safeguard or speculation?. *Journal of Financial Economics*, *105*(2), 436-456.

Aretz, K., Bartram, S.M. and Dufey, G., (2007). Why hedge? Rationales for corporate hedging and value implications. *The Journal of Risk Finance*, 8(5), 434-449.

Armstrong, C.S., Barth, M.E., Jagolinzer, A.D. and Riedl, E.J., (2010). Market reaction to the adoption of IFRS in Europe. *The accounting review*, 85(1), 31-61.

Asquith, P., Pathak, P. A., and Ritter, J. R. (2005). Short interest, institutional ownership, and stock returns. *Journal of Financial Economics*, *78*(2), 243-276.

Aysun, U., and Guldi, M. (2011). Derivatives market activity in emerging markets and exchange rate exposure. *Emerging Markets Finance and Trade*, *47*(6), 46-67.

Ayturk, Y., Gurbuz, A. O., and Yanik, S. (2016). Corporate derivatives use and firm value: Evidence from Turkey. *Borsa Istanbul Review*, *16*(2), 108-120.

Baily, M. N., and Elliott, D. J. (2009). The US financial and economic crisis: Where does it stand and where do we go from here. *Brookings Institution,* 1-26.

Bali, T. G., Hume, S. R., and Martell, T. F. (2007). A new look at hedging with derivatives: Will firms reduce market risk exposure?. *Journal of Futures Markets*, *27*(11), 1053-1083.

Balsam, S., and Kim, S. (2001). Effects of interest rate swaps. *Journal of Economics and Business*, *53*(6), 547-562.

Baltagi B.H. (2005). Econometric Analysis of Panel Data (3rd ed.)*, John Wiley & Sons*

Bamber, M. (2011). *An examination and assessment of mandatory financial instruments disclosures*, University of Exeter, United Kingdom.

Bamber, M., and McMeeking, K., (2016). An examination of international accounting standard-setting due process and the implications for legitimacy. *The British Accounting Review*, 48(1), 59-73.

Barron, O. E., Byard, D., and Kim, O. (2002). Changes in analysts' information around earnings announcements. *The Accounting Review*, *77*(4), 821-846.

Barry, C. B., and Brown, S. J. (1985). Differential information and security market equilibrium. *Journal of Financial and Quantitative Analysis*, *20*(4), 407-422.

Barth, M. E. (1994). Fair value accounting: Evidence from investment securities and the market valuation of banks. *Accounting Review*, 1-25.

Barth, M. E. (2000). Valuation-based accounting research: Implications for financial reporting and opportunities for future research. *Accounting & Finance*, *40*(1), 7-32.

Barth, M. E. (2006). Including estimates of the future in today's financial statements. Accounting Horizons, 20(3), 271-285.

Barth, M. E., and Landsman, W. R. (2010). How did financial reporting contribute to the financial crisis?. *European accounting review*, *19*(3), 399-423.

Barth, M. E., Beaver, W. H., and Landsman, W. R. (1996). Value-relevance of banks' fair value disclosures under SFAS No. 107. *Accounting Review*, 71(4), 513-537.

Barth, M. E., Beaver, W. H., and Landsman, W. R. (2001). The relevance of the value relevance literature for financial accounting standard setting: another view. *Journal of accounting and economics*, *31*(1), 77-104.

Barth, M. E., Landsman, W. R., and Wahlen, J. M. (1995). Fair value accounting: Effects on banks' earnings volatility, regulatory capital, and value of contractual cash flows. *Journal of banking & finance*, *19*(3), 577-605.

Bartram, S. (2002). The interest rate exposure of nonfinancial corporations. *Review of Finance*, *6*(1), 101-125.

Bartram, S.M., (2017). Corporate hedging and speculation with derivatives. Journal of Corporate Finance. 1-26

Bartram, S. M., Brown, G. W., and Conrad, J. (2011). The effects of derivatives on firm risk and value. *Journal of Financial and Quantitative Analysis*, *46*(4), 967-999.

Bartram, S. M., Brown, G. W., and Fehle, F. R. (2009). International evidence on financial derivatives usage. *Financial management*, *38*(1), 185-206.

Bashir, H., Sultan, K., and Jghef, O. K. (2013). Impact of Derivatives Usage on Firm Value: Evidence from Non Financial Firms of Pakistan. *Journal of Management Research*, *5*(4), 108-127.

Beatty, A., Chamberlain, S., and Magliolo, J. (1996). An empirical analysis of the economic implications of fair value accounting for investment securities. *Journal of Accounting and Economics*, *22*(1), 43-77.

Beber, A., and Fabbri, D. (2012). Who times the foreign exchange market? Corporate speculation and CEO characteristics. *Journal of Corporate Finance*, *18*(5), 1065-1087.

Belghitar, Y., Clark, E., and Mefteh, S. (2013). Foreign currency derivative use and shareholder value. *International Review of Financial Analysis*, *29*, 283-293.

Belk, P. A., and Glaum, M. (1990). The management of foreign exchange risk in UK multinationals: An empirical investigation. *Accounting and Business Research*, *21*(81), 3-13.

Ben Khediri, K., (2010). Do investors really value derivatives use? Empirical evidence from France. *The Journal of Risk Finance*, 11(1), 62-74.

Beneda, N., (2013). The impact of hedging with derivative instruments on reported earnings volatility. *Applied Financial Economics*, *23*(2), pp.165-179.

Benston, G. J. (2008). The shortcomings of fair-value accounting described in SFAS 157. *Journal of Accounting and Public Policy*, 27(2), 101-114.

Beretta, S., and Bozzolan, S. (2004). A framework for the analysis of firm risk communication. *The International Journal of Accounting*, 39(3), 265-288.

Berk, A. S., Peterlin, J., and Cok, M. (2009). Corporate risk management in Slovenian firms. *Managing global transitions*, *7*(3), 281-306

Berkman, H., and Bradbury, M. E. (1996). Empirical evidence on the corporate use of derivatives. *Financial management*, 25(2), 5-13.

Berkman, H., Bradbury, M. E., and Magan, S. (1997). An international comparison of derivatives use. *Financial Management*, 26(4), 69-73.

Berry, A. J., and Otley, D. T. (2004). *Case-based research in accounting. The real life guide to accounting research*, 1st ed 231-55.

Bessembinder, H. (1991). Forward contracts and firm value: Investment incentive and contracting effects. *Journal of Financial and quantitative Analysis*, *26*(4), 519-532.

Beyer, A., Cohen, D.A., Lys, T.Z. and Walther, B.R., (2010). The financial reporting environment: Review of the recent literature. *Journal of accounting and economics*, *50*(2), 296-343.

Birt, J., Rankin, M., and Song, C. L. (2013). Derivatives use and financial instrument disclosure in the extractives industry. *Accounting & Finance*, *53*(1), 55-83.

Blaikie, N. (2010). “Designing Social Research”. Polity Press

Bleck, A., and Liu, X. (2007). Market transparency and the accounting regime. *Journal of Accounting Research*, 45(2), 229-256.

Bodnar, G. M., Hayt, G. S., and Marston, R. C. (1998). 1998 Wharton survey of financial risk management by US non-financial firms. *Financial Management*, 27(4), 70-91.

Bodnar, G. M., Hayt, G. S., Marston, R. C., and Smithson, C. W. (1995). Wharton survey of derivatives usage by US non-financial firms. *Financial management*, 24(2), 104-114.

Bodnar, G. M., Jong, A. D., and Macrae, V. (2003). The impact of institutional differences on derivatives usage: A comparative study of US and Dutch firms. *European Financial Management*, 9(3), 271-297.

Borio, C., Hunter, W.C., Kaufman, G., Tsatsaronis, K., (2004). *Market Discipline Across Countries and Industries*. MIT Press, Cambridge, MA.

Borokhovich, K. A., Brunarski, K. R., Crutchley, C. E., and Simkins, B. J. (2004). Board composition and corporate use of interest rate derivatives. *Journal of Financial Research*, 27(2), 199-216.

Botosan, C. A., and Plumlee, M. A. (2002). A re-examination of disclosure level and the expected cost of equity capital. *Journal of accounting research*, *40*(1), 21-40.

Boyer, R. (2007). Assessing the impact of fair value upon financial crises. *Socio-Economic Review*, 5(4), 779-807.

Brunzell, T., Hansson, M., and Liljeblom, E. (2011). The use of derivatives in Nordic firms. *The European Journal of Finance*, *17*(5-6), 355-376.

Bryman, A., and Bell, E. (2007). *Business research methods*. Oxford University Press, USA.

Bryman,A. (2001). *Social Research Methods :* New York: Oxford University Press

Buckley, A., and Van Der Nat, M. (2003). Derivatives and the non-executive Director. *European Management* Journal, 21(3), 389-397.

Burrell, G., and Morgan, G. (1979). *Sociological paradigms and organisational Analysis*. London: Heinemann. Ltd.

Campbell, J. L. (2015). The fair value of cash flow hedges, future profitability, and stock returns. *Contemporary Accounting Research*, *32*(1), 243-279.

Campbell, J. L., Downes, J. F., and Schwartz, W. C. (2015). Do sophisticated investors use the information provided by the fair value of cash flow hedges?. *Review of Accounting Studies*, *20*(2), 934-975.

Campello, M., Giambona, E., Graham, J. R., and Harvey, C. R. (2011). Liquidity management and corporate investment during a financial crisis. *The Review of Financial Studies*, *24*(6), 1944-1979.

Campello, M., Lin, C., Ma, Y., and Zou, H. (2011). The real and financial implications of corporate hedging. *The journal of finance*, *66*(5), 1615-1647.

Carroll, A., O'Brien, F. and Ryan, J., (2017). An Examination of European Firms' Derivatives Usage: The Importance of Model Selection. *European Financial Management*, 23(4), 648-690.

Carter, D. A., Rogers, D. A., and Simkins, B. J. (2006). Does hedging affect firm value? Evidence from the US airline industry. *Financial Management*, 35(1), 53-86.

Chagwiza, W. (2013). Liquidity derivatives as solution to Zimbabwean economic liquidity problems, Global Advanced Research Journal of Economics, *Accounting and Finance*, 2(3), 67-72.

Chalmers, K., and Godfrey, J. M. (2004). Reputation costs: the impetus for voluntary derivative financial instrument reporting. *Accounting, Organizations and Society*, 29(2), 95-125.

Chamley, C. (2004), *Rational herds: Economic models of social learning*, Cambridge: Cambridge University Press.

Chang, H. S., Donohoe, M., and Sougiannis, T. (2016). Do analysts understand the economic and reporting complexities of derivatives?. *Journal of Accounting and Economics*, *61*(2), 584-604.

Chen, C.L., Fan, H.S., and Yang, Y.M., (2014). The effects of corporate governance and accounting rule changes on derivatives usage. *Review of Derivatives Research*, *17*(3), 323-353.

Chen, W., Tan, H. T., and Wang, E. Y. (2013). Fair Value Accounting and Managers' Hedging Decisions. *Journal of Accounting Research*, 51(1), 67-103.

Chernenko, S., and Faulkender, M. (2011). The two sides of derivatives usage: Hedging and speculating with interest rate swaps. *Journal of Financial and Quantitative Analysis*, 46(6), 1727-1754

Chiang, Y. C., and Lin, H. J. (2005). The Use of Foreign Currency Derivatives and Foreign-Denominated Debts to Reduce Exposure to Exchange Rate Fluctuations. *International Journal of Management*, 22(4), 598-604

Chiu, D., and Foerster, S. (1997). Using Derivatives to Manage Risk. *Business Quarterly*, *61(1)*, 56-64.

Choi, F., and Meek, G. (2008), *International Accounting*, 7th Ed, Chicago.

Chua, F. W. (1986) Radical developments in Accounting thought, *Accounting Review*, Vol. 61, pp. 601-632.

Clark, E., and Mefteh, S. (2010). Foreign Currency Derivatives Use, Firm Value and the Effect of the Exposure Profile: Evidence from France. *International Journal of Business*, *15*(2), 183-196.

Clement, M. B., and Tse, S. Y. (2005). Financial analyst characteristics and herding behavior in forecasting. *The Journal of finance*, *60*(1), 307-341.

Collier, P., and Davis, E. W. (1985). The management of currency transaction risk by UK multi-national companies. *Accounting and business research*, *15*(60), 327-334.

Collins, D. W., and Kothari, S. P. (1989). An analysis of intertemporal and cross-sectional determinants of earnings response coefficients. *Journal of accounting and economics*, *11*(2-3), 143-181.

Comiskey, E., and Mulford, C. (2009). The non-designation of derivatives as hedges for accounting purposes., *Journal of Applied Research in Accounting and Finance*, 3(2), 1-27.

Copeland, T. E., and Joshi, Y. (1996). Why derivatives don't reduce FX risk. *Risk Management*, *43*(7), 76-79.

Coppens, L. and Peek, E., (2005). An analysis of earnings management by European private firms. *Journal of International Accounting, Auditing and Taxation*, 14(1), 1-17.

Coutinho, J. R. R., Sheng, H. H., and Lora, M. I. (2012). The use of Fx derivatives and the cost of capital: evidence of Brazilian companies. *Emerging Markets Review*, *13*(4), 411-423.

Covrig, V.M., Defond, M.L. and Hung, M., (2007). Home bias, foreign mutual fund holdings, and the voluntary adoption of international accounting standards. *Journal of Accounting Research*, 45(1), 41-70.

Creswell, J.W. (2009), *Research Design: Qualitative, Quantitative, and Mixed Methods*. 2ed. Los Angeles: SAGE Publications.

Crouhy, M., Galai, D., and Mark, R. (2000). A comparative analysis of current credit risk models. *Journal of Banking & Finance*, 24(1), 59-117.

Culp, C. L., Miller, M. H., and Neves, A. M. (1998). Value at risk: uses and abuses. *Journal of Applied Corporate Finance*, 10(4), 26-38.

Cummins, J. D., Lewis, C. M., and Wei, R. (2006). The market value impact of operational loss events for US banks and insurers. *Journal of Banking & Finance*, *30*(10), 2605-2634.

Cummins, J. D., Phillips, R. D., and Smith, S. D. (1997). Corporate hedging in the insurance industry: The use of financial derivatives by US insurers. *North American Actuarial Journal*, *1*(1), 13-40.

DaDalt, P. J., Lin, B. X., and Lin, C. M. (2012). Do derivatives affect the use of external financing?. *Applied Economics Letters*, *19*(12), 1149-1152.

David, C. J., Phillips, R. D., and Smith, S. D. (1997). Corporate hedging in the insurance industry: the use of financial derivatives by US insurers. *North American Actuarial Journal*, 1(1), 13-40.

Deetz, S. (1996). Crossroads—Describing differences in approaches to organization science: Rethinking Burrell and Morgan and their legacy. *Organization science*, *7*(2), 191-207.

DeMarzo, P. M., and Duffie, D. (1995). Corporate incentives for hedging and hedge accounting. *Review of Financial Studies,* 8(3), 743-771.

Dhanani, A. (2000). To hedge or not to hedge?. *Management Accounting*, 78(3), 32-33.

Dilts, R., and DeLozier, J. (2000). *Encyclopedia of systemic neuro-linguistic programming and NLP new coding*. NLP University Press.

Dionne, G., and Triki, T. (2005). Risk management and corporate governance: The importance of independence and financial knowledge for the board and the audit committee. (Working Paper, Cahier de recherche).

Dolde, W., (1993), The trajectory of corporate financial risk management, *Journal of Applied Corporate Finance. 6(3)*, 33-41.

Donohoe, M. P. (2014). Financial derivatives in corporate tax avoidance: A conceptual perspective. *The Journal of the American Taxation Association*, *37*(1), 37-68.

Dontoh, A., Elayan, F. A., Ronen, J., and Ronen, T. (2012). Unfair'Fair Value'in an Opaque Credit Default Swap Market: How Marking-to-Market Pushed the International Credit Crunch. (Working Paper, New York University).

Doupnik, T. S., and Perera, H. (2007). *International accounting* (1st ed.). New York: McGraw-Hill/Irwin

Drummond, H. (2002). Living in a fool’s paradise: The collapse of Barings’ Bank. *Management Decision*, *40*(3), 232-238.

Dunne, T. M., and Helliar, C. V. (2002). The Ludwig report: implications for corporate governance. *Corporate Governance*, 2(3), 26-31.

Eccher, E. A., Ramesh, K., and Thiagarajan, S. R. (1996). Fair value disclosures by bank holding companies. *Journal of Accounting and Economics,* 22(1), 79-117.

El-Masry, A. A. (2006). Derivatives use and risk management practices by UK nonfinancial companies. *Managerial finance*, 32(2), 137-159.

Ernstberger, J., Krotter, S. and Stadler, C., (2008). Analysts' forecast accuracy in Germany: The effect of different accounting principles and changes of accounting principles. *Business Research*, 1(1), 26-53.

Esposito, L., Nobili, A., and Ropele, T. (2015). The management of interest rate risk during the crisis: evidence from Italian banks. *Journal of Banking & Finance*, *59*, 486-504.

Evans, L., Grimes, A., Wilkinson, B., and Teece, D. (1996). Economic reform in New Zealand 1984-95: the pursuit of efficiency. *Journal of Economic Literature*,34(4), 1856-1902.

Fan, J. P., Titman, S., and Twite, G. (2012). An international comparison of capital structure and debt maturity choices. *Journal of Financial and quantitative Analysis*, *47*(1), 23-56.

Fatemi, A., and Glaum, M. (2000). Risk management practices of German firms. *Managerial Finance*, 26(3), 1-17.

Faulkender, M. (2005). Hedging or market timing? Selecting the interest rate exposure of corporate debt. *The Journal of Finance,* 60(2), 931-962.

Fauver, L., and Naranjo, A. (2010). Derivative usage and firm value: The influence of agency costs and monitoring problems. *Journal of Corporate Finance*, 16(5), 719-735.

Fazillah, M., Hui, T.S., and Azizan, N.A. (2008). The relationship between hedging through forwards, futures & swaps and corporate capital structure in Malaysia (15 January 2008). Second Singapore International Conference on Finance 2008. Retrieved from SSRN: http://ssrn.com/abstract=1083922 or http://dx.doi.org/10.2139/ssrn.1083922

Frestad, D., (2010). Corporate hedging under a resource rent tax regime. *Energy Economics*, 32(2), 458-468

Froot, K. A., Scharfstein, D. S., and Stein, J. C. (1993). Risk managements coordinating corporate investment and financing policies. *The Journal of Finance*, 48(5), 1629-1658.

Gama, A. P. M., Segura, L. C., and Milani Filho, M. A. F. (2017). *The Value Relevance of the Variables Earnings and Book Value of Equity for Valuation Purposes. In Equity Valuation and Negative Earnings*. Singapore: Springer.

Gay, G. D., and Nam, J. (1998). The underinvestment problem and corporate derivatives use. *Financial Management*, 27(4), 53-69.

Gay, G. D., and Nam, J. (1998). The underinvestment problem and corporate derivatives use. *Financial Management*, 27(4), 53-69.

Gay, G.D., Nam, J. and Turac, M., (2003). On the optimal mix of corporate hedging instruments: Linear versus nonlinear derivatives. *Journal of Futures Markets: Futures, Options, and Other Derivative Products*, 23(3), 217-239.

Gebhardt, G. (2012). Financial instruments in non-financial firms: what do we know?. *Accounting and business research*, 42(3), 267-289.

Geczy, C. C., Minton, B. A., and Schrand, C. M. (2007). Taking a view: corporate speculation, governance, and compensation. *The Journal of Finance*, 62(5), 2405-2443.

Géczy, C., Minton, B. A., and Schrand, C. (1997). Why firms use currency derivatives. *The Journal of Finance*, 52(4), 1323-1354.

George, G. E., Ouma, B. O., and Were, J. N. (2013). Effects of Financial Risks on Profitability of Sugar Firms in Kenya. *European Journal of Business and Management*, 5(3), 152-160.

Georgiou, O. and Jack, L., (2011). In pursuit of legitimacy: A history behind fair value accounting. *The British Accounting Review,* 43(4), pp.311-323.

Glaum, M., and Klöcker, A. (2011). Hedge accounting and its influence on financial hedging: when the tail wags the dog. *Accounting and business research*, 41(5), 459-489.

Glover, S.M., Taylor, M.H. and Wu, Y.J., (2016). Current practices and challenges in auditing fair value measurements and complex estimates: Implications for auditing standards and the academy. *Auditing: A Journal of Practice & Theory*, 36(1), 63-84.

Goh, B. W., Ng, J., and Yong, K. O. (2009). Market pricing of banks 'fair value assets reported under SFAS 157 during the 2008 Economic Crisis. Document de travail disponible à l'adresse Internet suivante: http://papers. ssrn. com/sol3/papers. cfm.

Graham, J. R., and Rogers, D. A. (2002). Do firms hedge in response to tax incentives?. *The Journal of Finance,* 57(2), 815-839.

Graham, J. R., and Tucker, A. L. (2006). Tax shelters and corporate debt policy. *Journal of Financial Economics*, *81*(3), 563-594.

Grant, K., and Marshall, A. P. (1997). Large UK companies and derivatives. *European Financial Management*, 3(2), 191-208.

Gray, S.J., Meek, G.K., and Roberts, C.B., (1995). International capital market pressures and voluntary annual report disclosures by US and UK multinationals. *Journal of International Financial Management & Accounting*, 6(1), .43-68.

Gruber, M. J., and Warner, J. B. (1977). Bankruptcy costs: Some evidence. *The journal of Finance*, 32(2), 337-347.

Guay, W., and Kothari, S. P. (2003). How much do firms hedge with derivatives?. *Journal of Financial Economics*, 70(3), 423-461.

Gujarati, D. (2003). *Basic Econometrics*. New York: McGraw-Hill.

Gupta, P. (2017) A Review of Corporate Hedging Models and Their Relevance in Corporate Finance. *Theoretical Economics Letters*, 7, 102-115.

Gwilliam, D., and Jackson, R. H. (2008). Fair value in financial reporting: Problems and pitfalls in practice: A case study analysis of the use of fair valuation at Enron. *Accounting Forum, 32(3)*, 240-259.

Hagelin, N., and Pramborg, B. (2004). Hedging foreign exchange exposure: risk reduction from transaction and translation hedging. *Journal of International Financial Management & Accounting*, 15(1), 1-20.

Hakansson, N. H., Kunkel, J. G., and Ohlson, J. A. (1982). Sufficient and necessary conditions for information to have social value in pure exchange. *The Journal of Finance*, *37*(5), 1169-1181.

Halstead, J. M., Hegde, S., and Klein, L. S. (2004). Orange county bankruptcy: financial contagion in the municipal bond and bank equity markets. *Financial Review*, 39(2), 293-315.

Haushalter, G. D. (2000). Financing policy, basis risk, and corporate hedging: Evidence from oil and gas producers. *The Journal of Finance*, *55*(1), 107-152.

Haushalter, G.D. (2000) Financing policy, basis risk, and corporate hedging: Evidence from oil and gas producers, Journal of Finance 55, 107-152.

Hausman, J. A., and Taylor, W. E. (1981). Panel data and unobservable individual effects. *Econometrica: Journal of the Econometric Society*, 1377-1398.

Healy, P. M., and Palepu, K. G. (2001). Information asymmetry, corporate disclosure, and the capital markets: A review of the empirical disclosure literature. *Journal of accounting and economics*, 31(1), 405-440.

Heaney, R., and Winata, H. (2005). Use of derivatives by Australian companies. *Pacific-Basin Finance Journal*, 13(4), 411-430.

Heldesten, E.M., Lagerholm, C. and Persson, S., (2013). Fair Value Measurement–The Complexity of Valuation. *IFRS Accounting in Progress*, p.25.

Hentschel, L., and Kothari, S. P. (2001). Are corporations reducing or taking risks with derivatives?. *Journal of Financial and Quantitative Analysis*, 36(01), 93-118.

Hirshleifer, D., and Teoh, S. H. (2003). Limited attention, information disclosure, and financial reporting. *Journal of accounting and economics*, *36*(1), 337-386.

Hitz, J. M. (2007). The decision usefulness of fair value accounting–a theoretical perspective. *European Accounting Review*, 16(2), 323-362.

Hodder, L. D., and Hopkins, P. E. (2012). Accounting slack and banks' response to proposed fair value accounting for loans. (Working Paper, Indiana University).

Hogan, W. P. (1997). Corporate governance: lessons from Barings. *Abacus*, 33(1), 26-48.

Holthausen, R.W. and Watts, R.L., (2001). The relevance of the value-relevance literature for financial accounting standard setting. *Journal of accounting and economics*, 31(1-3), pp.3-75.

Howton, S. D., and Perfect, S. B. (1998). Currency and interest-rate derivatives use in US firms. *Financial Management*, 27(4), 111-121.

Hoyt, R. E., and Liebenberg, A. P. (2011). The value of enterprise risk management. *Journal of risk and insurance*, *78*(4), 795-822.

Huang, A. H., Zang, A. Y., and Zheng, R. (2014). Evidence on the information content of text in analyst reports. *The Accounting Review*, *89*(6), 2151-2180.

Huang, J., Su, C., Joseph, N.L. and Gilder, D., (2018). Monitoring mechanisms, managerial incentives, investment distortion costs, and derivatives usage. The British Accounting Review, 50(1), pp.93-141.

Huang, P., Ryan Jr, H.E. and Wiggins III, R.A., (2007). The influence of firm-and CEO-specific characteristics on the use of nonlinear derivative instruments. *Journal of Financial Research*, 30(3), 415-436.

Huang, P., Zhang, Y., Deis, D. R., and Moffitt, J. S. (2009). Do artificial income smoothing and real income smoothing contribute to firm value equivalently? *Journal of Banking & Finance*, 33(2), 224-233.

Huber, C., and Scheytt, T. (2013). The dispositif of risk management: Reconstructing risk management after the financial crisis. *Management Accounting Research*, *24*(2), 88-99.

Hughen, L. (2010). When Do Accounting Earnings Matter More than Economic Earnings? Evidence from Hedge Accounting Restatements. *Journal of Business Finance & Accounting*, 37(9-10), 1027-1056.

Hunton, J. E., McEwen, R. A., and Bhattacharjee, S. (2001). Toward an understanding of the risky choice behavior of professional financial analysts. *The Journal of Psychology and Financial Markets*, *2*(4), 182-189.

Ifeanyichukwu, O. J. (2013), Transforming Nigeria Economy Through the Use of Derivatives, *Advances in Applied Economics and Finance*, Vol. 4, No. 1, pp.668-677

Imam, S., Barker, R., and Clubb, C. (2008). The use of valuation models by UK investment analysts. *European Accounting Review*, *17*(3), 503-535.

Ittner, C. D., and Michels, J. (2017). Risk-based forecasting and planning and management earnings forecasts. *Review of Accounting Studies*, *22*(3), 1005-1047.

Jalilvand, A. (1999). Why firms use derivatives: evidence from Canada. *Canadian Journal of Administrative Sciences/Revue Canadienne des Sciences de l'Administration*, *16*(3), 213-228.

Jankensgård, H. (2015). Does centralisation of FX derivative usage impact firm value?. *European Financial Management*, *21*(2), 309-332.

Jankensgård, H., Alviniussen, A., and Oxelheim, L. (2016). Why FX Risk Management Is Broken–and What Boards Need to Know to Fix It. *Journal of Applied Corporate Finance*, *28*(1), 46-61.

Jiao, T., Koning, M., Mertens, G., and Roosenboom, P. (2012). Mandatory IFRS adoption and its impact on analysts' forecasts. *International review of financial analysis*, *21*, 56-63.

Jin, Y., and Jorion, P. (2006). Firm value and hedging: Evidence from US oil and gas producers. *The Journal of Finance*, 61(2), 893-919.

Jones, T. C., and Dugdale, D. (2002). The ABC bandwagon and the juggernaut of modernity. *Accounting, Organizations and Society*, *27*(1), 121-163.

Jovanovic, B. (1982), Truthful disclosure of information, *Bell Journal of Economics*, Vol. 13, pp. 36–44.

Judge, A. (2006). Why and how UK firms hedge. *European Financial Management*, *12*(3), 407-441.

Júnior, J. L. R., and Laham, J. (2008). The impact of hedging on firm value: evidence from Brazil. *Journal of International Finance & Economics*, *8*(1), 76-91.

Kalof, L., Dan, A., and Dietz, T. (2008). *Essentials of social research*. McGraw-Hill Education (UK).

Kanagaretnam, K., Mathieu, R., and Shehata, M. (2009). Usefulness of comprehensive income reporting in Canada. *Journal of Accounting and Public Policy*, *28(4)*, 349-365.

Karpoff, J. M. (1987). The relation between price changes and trading volume: A survey. *Journal of Financial and quantitative Analysis*, *22*(1), 109-126.

Kawaller, I. G. (2004). What analysts need to know about accounting for derivatives. *Financial Analysts Journal*, *60*(2), 24-30.

Keyes, K. M. (2008). *Federal Taxation of Financial Instruments and Transactions*. Boston, MA: Warren, Gorham, & Lamont Publishing.

Kolev, K. (2009). *Do Investors Perceive Marking-to-model as Marking-to-myth?: Early Evidence from FAS 157 Disclosure* (Doctoral dissertation, New York University, Graduate School of Business Administration).

Koski, J. L., and Pontiff, J. (1999). How are derivatives used? Evidence from the mutual fund industry. *The Journal of Finance,* 54(2), 791-816.

Kozarević, E., Kešetović, I., Jukan, M. K., and Čivić, B. (2012). The usage of Derivatives in financial risk management by companies in Bosnia and Herzegovina. *Economic Review*, 10(2), 59-72

Lambert, R., Leuz, C., and Verrecchia, R. (2007b), Information Asymmetry, Information Precision and the Cost of Capital, Working paper, Wharton School and University of Chicago.

Lambert, R., Leuz, C., and Verrecchia, R. E. (2007). Accounting information, disclosure, and the cost of capital. *Journal of Accounting Research*, 45(2), 385-420.

Landsman, W. (2006). Fair value accounting for financial instruments: some implications for bank regulation, Bank of International Settlements, BIS Working Papers No.209.

Laughlin, R. (1995). Empirical research in accounting: alternative approaches and a case for “middle-range” thinking. *Accounting, Auditing & Accountability Journal*, *8*(1), 63-87.

Laughlin, R. and Gray, R., (1988). *Financial Accounting: method and meaning*. Taylor & Francis.

Laux, C. (2012). Financial instruments, financial reporting, and financial stability. *Accounting and business research,* 42(3), 239-260.

Laux, C., and Leuz, C. (2010). Did fair-value accounting contribute to the financial crisis?. *The Journal of Economic Perspectives*, *24*(1), 93-118.

Lel, U. (2012). Currency hedging and corporate governance: a cross-country analysis. *Journal of Corporate Finance*, 18(2), 221-237.

Leland, H. E. (1988). Portfolio insurance and October 19th. *California Management Review*, *30*(4), 80-89.

Leuz, C., and Wysocki, P. (2008). Economic consequences of financial reporting and disclosure regulation: A review and suggestions for future research. Working paper Available at SSRN 1105398.

Lewis, M., (2008). *Introduction. In: Lewis, M. (Ed.), Panic! The Story of Modern Financial Insanity*. London: Penguin,.

Li, W., and Stammerjohan, W. W. (2005). Empirical Analysis of Effects of SFAS No. 133 on Derivative Use and Earnings Smoothing. *Journal of Derivatives Accounting*, 2(01), 15-30.

Lievenbrueck, M., and Schmid, T. (2013). Why do firms (not) hedge? - Novel evidence on cultural influence. *Journal of Corporate Finance,* 25, 92-106.

Lins, K. V., Servaes, H., and Tamayo, A. (2011). Does fair value reporting affect risk management? International survey evidence. *Financial management*, 40(3), 525-551.

Lins, K., H. Servaes., and A. Tamayo. (2008). Does Derivative Accounting Affect Risk Management? (Working Paper, University of Utah).

Lintner, J. (1969). The aggregation of investor's diverse judgments and preferences in purely competitive security markets. Journal of financial and quantitative analysis, 4(4), 347-400.

Lookman, A. A. (2004). Does hedging really increase firm value? Evidence from oil and gas producing firms. Working Paper, Carnegie Mellon University.

Luo, X., Wang, H., Raithel, S., and Zheng, Q. (2015). Corporate social performance, analyst stock recommendations, and firm future returns. *Strategic Management Journal*, *36*(1), 123-136.

MacKay, P., and Moeller, S. B. (2007). The value of corporate risk management. *The Journal of Finance*, 62(3), 1379-1419.

Mallin, C., Ow-Yong, K., and Reynolds, M. (2001). Derivatives usage in UK non-financial listed companies. *The European Journal of Finance*, 7(1), 63-91.

Marsden, A., and Prevost, A. K. (2005). Derivatives use, corporate governance, and legislative change: an empirical analysis of New Zealand listed companies. *Journal of business finance & accounting*, *32*(1-2), 255-295.

Martin, M. Á., Rojas, W., Erausquin, J., Yupanqui y Edgar Vera, D., and Bauer, W. (2009). Derivative Usage by Non-Financial Firms in Emerging Markets: The Peruvian Case. *Journal of Economics, Finance & Administrative Science*,14(28), 74-86.

Mayers, D., and Smith Jr, C. W. (1982). On the corporate demand for insurance. *Journal of Business*, 55(2), 281-296.

Mayers, D., and Smith Jr, C. W. (1987). Corporate insurance and the underinvestment problem. *Journal of Risk and Insurance, 54(1)*, 45-54.

Mayers, D. and Smith Jr, C.W., (1990). On the corporate demand for insurance: evidence from the reinsurance market. *Journal of Business*, 19-40.

Mayew, W. J., Sharp, N. Y., and Venkatachalam, M. (2013). Using earnings conference calls to identify analysts with superior private information. *Review of Accounting Studies*, *18*(2), 386-413.

McDonald, R. L. (2004). The tax (dis) advantage of a firm issuing options on its own stock. *Journal of Public Economics*, 88(5), 925-955.

McGuire, S. T., Wang, D., and Wilson, R. J. (2014). Dual class ownership and tax avoidance. *The Accounting Review*, *89*(4), 1487-1516.

McShane, M. K., Nair, A., and Rustambekov, E. (2011). Does enterprise risk management increase firm value?. *Journal of Accounting, Auditing & Finance*, *26*(4), 641-658.

Melumad, N. D., Weyns, G., and Ziv, A. (1999). Comparing alternative hedge accounting standards: Shareholders' perspective. *Review of Accounting Studies*, 4(3-4), 265-292.

Merton, R.C. (1987), A simple model of capital market equilibrium within complete information, *The Journal of Finance*, Vol. 42, pp. 483–510.

Mian, S. L. (1996). Evidence on corporate hedging policy. *Journal of Financial and Quantitative Analysis*, 31(3).419-439.

Mihaljek, D., and Packer, F. (2010). Derivatives in emerging markets. *BIS Quarterly Review*, December.

Miller, K. D. (1992). A framework for integrated risk management in international business. *Journal of international business studies*, 311-331.

Miller, R. L., and Brewer, J. D. (1st Ed). (2003). *The AZ of social research: A dictionary of key social science research concepts*. London:Sage.

Millo, Y., and MacKenzie, D. (2009). The usefulness of inaccurate models: Towards an understanding of the emergence of financial risk management. *Accounting, Organizations and Society*, *34*(5), 638-653.

Minton, B. A., Stulz, R., and Williamson, R. (2009). How much do banks use credit derivatives to hedge loans?. *Journal of Financial Services Research*,35(1), 1-31.

Mizerka, J. and Stróżyńska, A., (2013). Factors Influencing the Use of Derivatives in Poland. Journal of Finance, 2(1), pp.557-560.

Modigliani, F., and Miller, M. H. (1958). The cost of capital, corporation finance and the theory of investment. *The American economic review*, 48(3), 261-297.

Morellec, E., and Smith, C. W. (2007). Agency conflicts and risk management. *Review of Finance*, 11(1), 1-23.

Mozes, H. A. (2002). The value relevance of financial institutions' fair value disclosures: A Study in the difficulty of linking unrealized gains and losses to equity values. *Abacus*, 38(1), 1-15.

Muhrtala, T. O., and Mohammed, A. K. (2013). Foreign Exchange Derivatives in Emerging Economies: Evidence from Nigerian Financial Services Industry. *Journal of African Macroeconomic Review*, 3(1), 206-225.

Muhrtala, T. O., and Ogundeji, M. G. (2013). Derivatives and Financial Risk Management in Nigeria: Evidence from Non-Financial Firms. *African Journal of Scientific Research*, 11(1), 1-27.

Muller, A., and Verschoor, W. F. (2007). Asian foreign exchange risk exposure. *Journal of the Japanese and International Economies*, 21(1), 16-37.

Murphy, A. (2010). The mispricing of credit default swaps: Institutional causes and effects. *Banking and Finance Review*, *2*(2). 105-118.

Myers, S. C. (1977). Determinants of corporate borrowing. *Journal of financial economics*, 5(2), 147-175.

Nance, D. R., Smith, C. W., and Smithson, C. W. (1993). On the determinants of corporate hedging. *The Journal of Finance*, 48(1), 267-284.

Nelson, K. K. (1996). Fair value accounting for commercial banks: An empirical analysis of SFAS No. 107. *Accounting Review*, 71(2), 161-182.

Nelson, James M. & Moffitt, Jacquelyn Sue & Affleck-Graves, John, (2005). "The impact of hedging on the market value of equity," *Journal of Corporate Finance*, 11(5), 851-881, October

Neuman, W.L. (2011), *Social Research Methods: Qualitative and Quantitative Approaches*, 7th ed, Boston: Pearson/Allyn and Bacon.

Nguyen, H. V., Mensah, M. O., and Fan, Y. (2007). Derivative instruments and their use for hedging by US non-financial firms: A Review of theories and empirical evidence. Electronic copy available at: http://ssrn.com/abstract=1082932

Nguyen, H., and Faff, R. (2003). Can the use of foreign currency derivatives explain variations in foreign exchange exposure?: Evidence from Australian companies. *Journal of Multinational Financial Management*, 13(3), 193-215.

Nissim, D. and Penman, S.H., (2008). Principles for the application of fair value accounting. *Columbia University in the city of New York,* 1-80.

Ohlson, J. A. (1995). Earnings, book values, and dividends in equity valuation. *Contemporary accounting research*, *11*(2), 661-687.

Ohlson, J. A. (1999). On transitory earnings. *Review of Accounting Studies*, 4(3-4), 145-162.

Osterland, A. (2000). Good Morning, Volatility FASB's new derivatives rules aren't as bad as once feared, but they'll still cost considerable sleep. *CFO*, 16(8), 129-133.

Overdahl, J., and Schachter, B. (1995). Derivatives regulation and financial management: lessons from gibson greetings. *Financial Management*, 24(1), 68-78.

Paligorova, T., and Staskow, R., (2014). The Use of Financial Derivatives by Canadian Firms. *Bank of Canada Review*, *2014(3)*, .47-54.

Panaretou, A., Shackleton, M. B., and Taylor, P. A. (2012). Corporate Risk Management and Hedge Accounting. *Contemporary Accounting Research*, 30(1), 116–139

Panaretou, A., Shackleton, M. B., and Taylor, P. A. (2013). Corporate Risk Management and Hedge Accounting*. *Contemporary Accounting Research*,*30*(1), 116-139.

Panaretou, A.,(2014). Corporate risk management and firm value: evidence from the UK market. *The European Journal of Finance*, 20(12), 1161-1186.

Park, M. S., Park, T., and Ro, B. T. (1999). Fair value disclosures for investment securities and bank equity: evidence from SFAS No. 115. *Journal of Accounting, Auditing & Finance*, 14(3), 347-370.

Partnoy, F. (2003). Lessons from Enron, how did corporate and securities law fail. *Villanova Law Review*, *48*(4).

Patterson, M.E., and Williams, D.R., (1998). *Paradigms and problems: The practice of social science in natural resource management*. Taylor & Francis

Pérignon, C., and Smith, D. R. (2010). The level and quality of Value-at-Risk disclosure by commercial banks. *Journal of Banking & Finance*, *34*(2), 362-377.

Petroni, K. R., and Wahlen, J. M. (1995). Fair values of equity and debt securities and share prices of property-liability insurers. *Journal of Risk and Insurance*, 62(4), 719-737.

Phillips, A. L. (1995). Derivatives practices and instruments survey. *Financial Management*, 24(2), 115-125.

Pierce, S. (2015), “Does the accounting for derivatives affect risk and value?” working paper: Florida State University

Pirchegger, B. (2006). Hedge accounting incentives for cash flow hedges of forecasted transactions. *European accounting review*, 15(1), 115-135.

Plantin, G., Sapra, H., and Shin, H. S. (2008). Marking-to-Market: Panacea or Pandora's Box?. *Journal of accounting research*, 46(2), 435-460.

Pollock, A. J. (2005). FAS 133: What Is Accounting Truth?. *Journal of applied corporate finance*, 17(3), 102-106.

Power, M. (2009). The risk management of nothing. *Accounting, organizations and society*, *34*(6), 849-855.

Prevost, A. K., Rose, L. C., and Miller, G. (2000). Derivatives usage and financial risk management in large and small economies: a comparative analysis. *Journal of Business Finance & Accounting, 27(5-6),* 733-759.

Purnanandam, A. (2008). Financial distress and corporate risk management: Theory and evidence. *Journal of Financial Economics, 87(3),* 706-739.

Rahardjo, K., and Dowling, M. A. (1998). A broader vision: strategic risk management. *Risk Management, 45(9),* 44-50.

Ramnath, S., Rock, S., and Shane, P. (2008). The financial analyst forecasting literature: A taxonomy with suggestions for further research. *International Journal of Forecasting*, *24*(1), 34-75.

Read, M., and Marsh, D. (2002). Combining qualitative and quantitative methods. *Theory and methods in political science*, *2*, 231-48.

Revsine, L. (2002). Enron: sad but inevitable. *Journal of Accounting and Public Policy*, *21*(2), 137-145.

Rivas, A., Ozuna, T., and Policastro, F. (2006). Does the use of derivatives increase bank ef ciency? Evidence for Latin American banks. *International Business & Economics Research Journal, 5(11),* 47-56.

Rodriguez, R. M. (1981). Corporate exchange risk management: theme and aberrations. *The Journal of Finance*, 36(2), 427-439.

Rossi Júnior, J. L. (2007). The use of currency derivatives by Brazilian companies: an empirical investigation. *Brazilian Review of Finance, 5(2),* 205-232

Ryan, S. G. (2007). *Financial instruments and institutions: Accounting and disclosure rules*. John Wiley & Sons.

Ryan, S. G. (2012). Financial reporting for financial instruments. *Foundations and Trends® in Accounting*, *6*(3–4), 187-354.

Ryan, S. G., Herz, R. H., Iannaconni, T. E., and Maines, L. A. (2002). Recommendations on hedge accounting and accounting for transfer of financial instruments. *Accounting Horizons, 16(1),* 81-93.

Saito, R., and R. F. Schiozer (2005). Derivatives Usage and Risk Management by Non Financial Firms: A Comparison between Brazilian and International Evidence. Can be downloaded from *SSRN: http://ssrn.com/abstract=677862*.

Sang, L. T., Abu, Z. K., and Osman, Z. (2013). The determinants of corporate hedging. *Journal of the Asian Academy of Applied Business,2(1),* 44-55.

Sapra, H. (2002). Do mandatory hedge disclosures discourage or encourage excessive speculation?. *Journal of Accounting Research*, *40*(3), 933-964.

Sarantakos, S. (2005). *Social Research*. 3rd. Hampshire: Palgrave Macmillan.

Saunders, M. Lewis, P., and Thornhill, A. (2007). *Research Methods for Business Students* (4th ed.): Harlow: Financial Times Prentice Hall.

Schiller, S., and Lundh, S. (2013). IFRS Accounting in Progress from a student perspective, (Published and distributed by Department of Management and Engineering, Linköping University, Sweden),ISBN: 978-91-7519-654-1

Schiozer, R. F., and Saito, R. (2009). The determinants of currency risk management in Latin American nonfinancial firms. *Emerging Markets Finance and Trade, 45(1),* 49-71.

Schipper, K. (1991). Analysts' forecasts. *Accounting horizons*, *5*(4), 105-121.

Schrand, C. M. (1997). The association between stock-price interest rate sensitivity and disclosures about derivative instruments. *The Accounting review*, 72(1), 87-109.

Selvi, Y., and Türel, A. (2010). Derivatives usage in risk management by Turkish non-financial firms and banks: a comparative study. *Annales Universitatis Apulensis: Series Oeconomica*, *12*(2), 663-671.

Seow, G. S., and Tam, K. (2002). The usefulness of derivative-related accounting disclosures. *Review of Quantitative Finance and Accounting*, 18(3), 273-291.

Servaes, H. (1996). The value of diversification during the conglomerate merger wave. *The Journal of Finance*, *51*(4), 1201-1225.

Shapiro, A. C. (1985). Currency risk and country risk in international banking. *The Journal of Finance, 40(3)*, 881-891.

Sheikh, S. A. (2011). Derivatives as Instruments o risk management among firms listed at Nairobi Securities Exchange. (Jomo Kenyatta University of agriculture and Technology), Proceeding of First Shrd Annual research conference held on 12th and 13th of September 2013 a Jkuat main campus, 256.-264

Shleifer, A., and Wolfenzon, D. (2002). Investor protection and equity markets. *Journal of Financial Economics*, *66*(1), 3-27.

Shu, P. G., and Chen, H. C. (2003). The determinants of derivatives use: Evidence from non-financial firms in Taiwan. *Review of Pacific Basin Financial Markets and Policies*, 6(04), 473-500.

Simko, P. J. (1999). Financial instrument fair values and nonfinancial firms. *Journal of accounting, auditing & finance*, 14(3), 247-274.

Singh, A. (2009). The relation between interest rate derivatives, debt maturity structure, and exposure in the lodging industry. *Journal of Hospitality & Tourism Research*, 33(3), 391-416.

Singh, A., and Upneja, A. (2008). The determinants of the decision to use Financial Derivatives in the Lodging industry. *Journal of Hospitality & Tourism Research*, 32(4), 423-447

Sinkey, J. F., and Carter, D. A. (2001). Evidence on the financial characteristics of banks that do and do not use derivatives. *The Quarterly Review of Economics and Finance*, *40*(4), 431-449.

Skinner, D. J. (1996). Are disclosures about bank derivatives and employee stock options 'value-relevant'?. *Journal of Accounting and Economics*, 22(1), 393-405.

Smith, C. W., and Stulz, R. M. (1985). The determinants of firms' hedging policies. *Journal of financial and quantitative analysis,* 20(4), 391-405.

Smithson, C., and Simkins, B. J. (2005). Does risk management add value? A survey of the evidence. *Journal of Applied Corporate Finance*, *17*(3), 8-17.

Song, C. J., Thomas, W. B., and Yi, H. (2010). Value relevance of FAS No. 157 fair value hierarchy information and the impact of corporate governance mechanisms. *The Accounting Review*, 85(4), 1375-1410.

Stout, L. A., (2011). Derivatives and the Legal Origin of the 2008 Credit Crisis. *Cornell Law Faculty Publications. Paper* 720. *http://scholarship.law.cornell.edu/facpub/720*

Štulec, I., Baković, T., and Dužević, I. (2013). The impact of company characteristics on derivatives usage: survey study of large Croatian companies. *Mediterranean Journal of Social Sciences*, 4(10), 59-67

Stulz, R. (2013). How companies can use hedging to create shareholder value. *Journal of Applied Corporate Finance*, *25*(4), 21-29.

Stulz, R. M. (2009). Credit default swaps and the credit crisis. *The Journal of Economic Perspectives*, 24(1), 73-92

Supanvanij, J., and Strauss, J. (2006). The effects of management compensation on firm hedging: Does SFAS 133 matter?. *Journal of Multinational Financial Management*, 16(5), 475-493.

Titman, S. (1985). The effect of forward markets on the debt-equity mix of investor portfolios and the optimal capital structure of firms. *Journal of Financial and Quantitative Analysis*, 20(1), 19-28.

Titman, S., and Wessels, R. (1988). The determinants of capital structure choice. *The Journal of finance*, *43*(1), 1-19.

Titova, Y., and Girard, A. (2012). Impact of derivatives use intensity and credit risk exposure on European bank risks, Can be downloaded from *http://events.em-lyon.com/AFFI/Papers/186.pdf*

Treanor, S. D., Rogers, D. A., Carter, D. A., and Simkins, B. J. (2014). Exposure, hedging, and value: New evidence from the US airline industry. *International Review of Financial Analysis*, *34*, 200-211.

Tufano, P. (1996). Who manages risk? An empirical examination of risk management practices in the gold mining industry. *The Journal of Finance*, 51(4), 1097-1137.

Undated manuscript available at http://sfm.finance.nsysu.edu.tw/pdf/2013pdf/061-1459878159.pdf. The most recent extant paper referenced in the manuscript is date 2011

Velasco, L. G. (2014). Factors Influencing Derivatives Usage by Selected Listed Companies in the Philippines. *Philippine Management Review*, 21(1), 1-12.

Venkatachalam, M. (1996). Value-relevance of banks' derivatives disclosures. *Journal of Accounting and Economics*, 22(1), 327-355.

Véron, N. (2008). Fair value accounting is the wrong scapegoat for this crisis. Accounting in Europe, 5(2), 63-69.

Verrecchia, R. (1983), Discretionary Disclosure, *Journal of Accounting and Economics*, 5, 179-194.

Verrecchia, R. E. (2001). Essays on disclosure. *Journal of accounting and economics*, 32(1), 97-180.

Vrolijk, C. (1997). *Derivatives Effecton Monetary Policy Transmission* (No. 97-121). International Monetary Fund.

Wall, L. D., and Pringle, J. J. (1989). Alternative explanations of interest rate swaps: A theoretical and empirical analysis. *Financial Management*, 59-73.

Wallace, J. W. (2008). *The Financial Crisis and the Federal Reserve*. News Blaze.

Wallace, M., (2009), Is fair-value accounting responsible for the financial crisis?, *Bank Accounting & Finance. 22(1)*, 9-18.

Walton, P. (2004). IAS 39: Where different accounting models collide. *Accounting in Europe*, 1(1), 5-16.

Wang, L., Alam, P., and Makar, S. (2005). The value-relevance of derivative disclosures by commercial banks: A comprehensive study of information content under SFAS Nos. 119 and 133. *Review of Quantitative Finance and Accounting*, 25(4), 413-427.

Warren Jr, A. C. (2004). US income taxation of new financial products. *Journal of Public Economics*, 88(5), 899-923.

Watts, R.L., (2003). Conservatism in accounting part I: Explanations and implications. *Accounting horizons*, 17(3), 207-221.

Welch, I. (2000). Herding among security analysts. *Journal of Financial economics*, *58*(3), 369-396.

Whittington, G. (2005), The adoption of international accounting standards in the European Union, *European Accounting Review*, 14(1), 127-153.

Wysocki, P. (1996). Managerial motives and corporate use of derivatives: Some evidence. Simon School of Business, University of Rochester Working Paper.

Yip, W. H., and Nguyen, H. (2012). Exchange rate exposure and the use of foreign currency derivatives in the Australian resources sector. *Journal of Multinational Financial Management*, 22 (4), 151-167.

Young, D., and Guenther, D. A. (2003). Financial reporting environments and international capital mobility. *Journal of Accounting Research*, 41(3), 553-579.

Zeidan, R., and Rodrigues, B. (2013). The failure of risk management for nonfinancial companies in the context of the financial crisis: lessons from Aracruz Celulose and hedging with derivatives. *Applied Financial Economics,* 23(3), 241-250.

Zhang, H. (2009). Effect of derivative accounting rules on corporate risk-management behavior. *Journal of accounting and economics*, 47(3), 244-264.

Zhou, V. Y., and Wang, P. (2013). Managing foreign exchange risk with derivatives in UK non-financial firms. *International Review of Financial Analysis*,*29*, 294-302.